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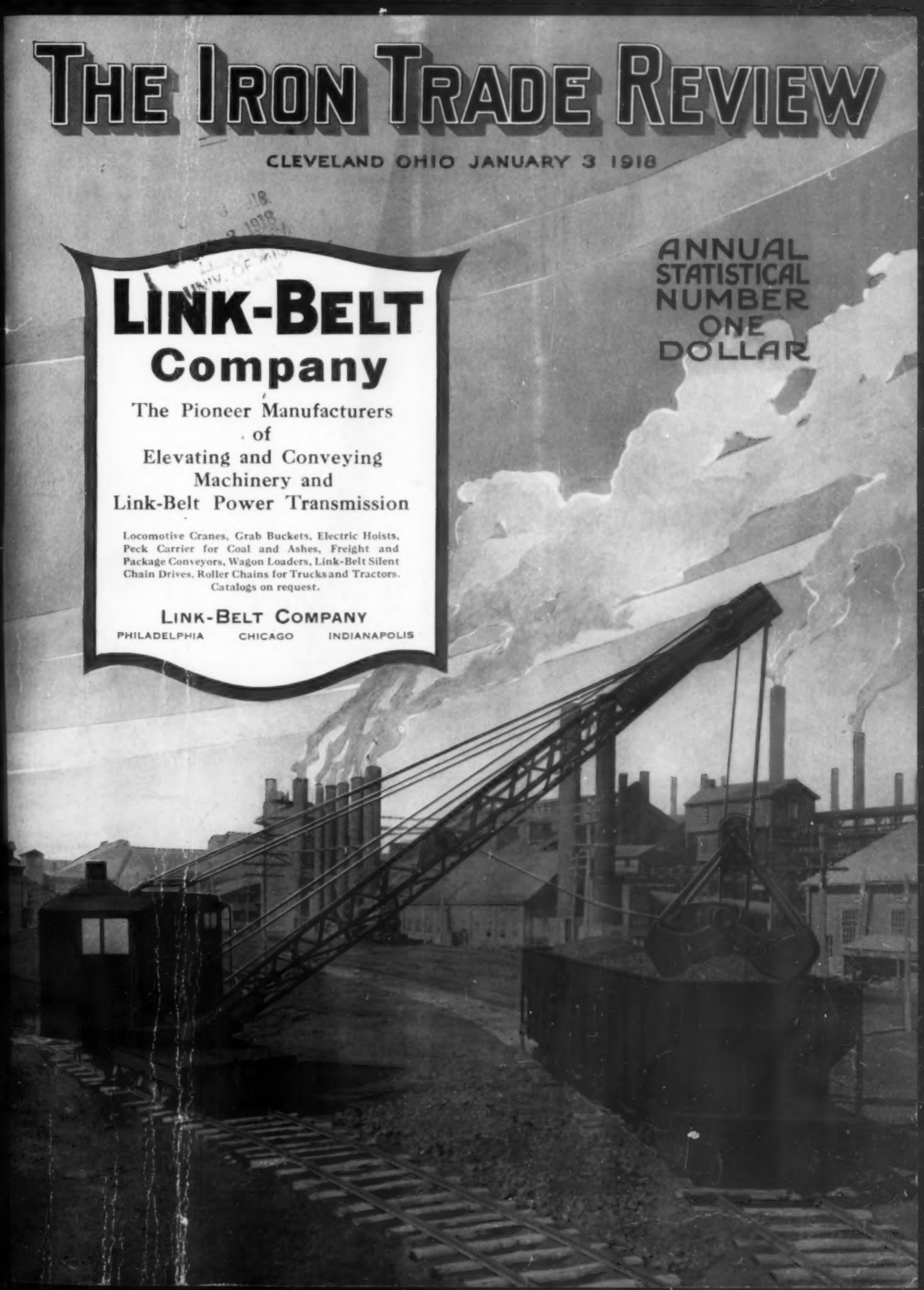

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THE IRON TRADE REVIEW

Volume LXII Cleveland, Ohio, January 3, 1918 *No. 1*

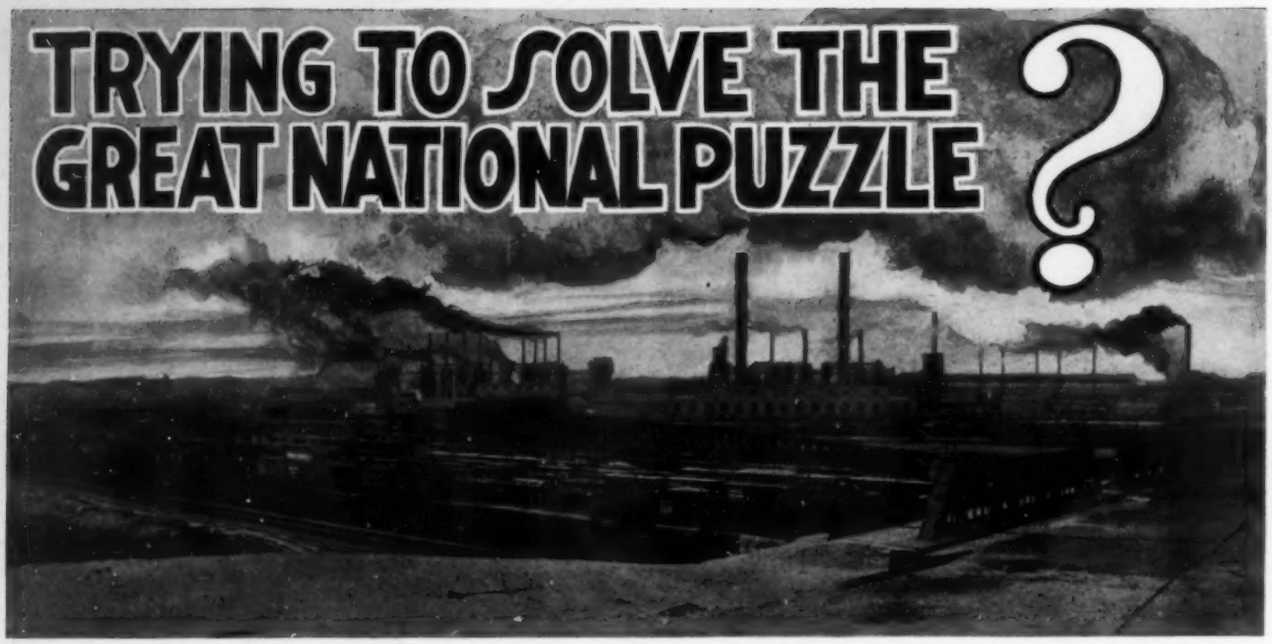
Iron and Steel Industry Meets Supreme Test

WASHINGTON has taken unto itself the scepter of the iron and steel industry. All the major movements affecting prices or distribution, management or production now have their root in the capital city. Tonnage and capacity count for little at this time in the determination of rank among the great producing centers of the industry. Each is doing its part loyally. The industry is acting as a unit, producing as a unit and is under control as a unit. National necessity has superseded all considerations of trade advantage. Competition has become that of patriotic service. In the cause of humanity and justice, the leading iron and steel industry of the world is pitting itself ingot for ingot and ton for ton against its greatest rival which has perverted its power.

Great responsibility and demands already have been placed upon the American iron and steel industry and its leaders. The response has been as creditable as the industry is great. What ultimate form this duty will attain in the coming year is not defined. That it will be tremendous in importance and magnitude there is little doubt. It is with high praise for the performances of the past as well as confidence for the future that Secretary of Navy Josephus Daniels says:

> "The response of the iron and steel industry as a whole to the call of the nation for increased production of steel, which is absolutely necessary to the successful prosecution of the war, has been gratifying to the navy department, whose requirements are and will continue to be a large factor in the growing demand. On the threshold of this New Year I desire to express my appreciation of the past efforts of the steel industry generally and my confidence that it can and will meet all the tonnage requirements which will be asked of it in 1918. Every mill must keep rolling and every man must do his part to bring about this result. Ships and munitions and more munitions and more ships will win the war. To supply this essential we must have steel and more steel and still more steel."

Modern war in all its complex phases when finally reduced, is a matter of industry, and iron and steel lie at its foundation. The United States is blessed in the possession not only of the capacity to produce the basic materials of peace or war, far exceeding any other nation, but also mechanically the means equally powerful to fashion it to the needs of battle. In the present struggle of giant forces, a nation of 43,000,000 tons is at grips with one of 18,000,000 tons. The relative potentialities are manifest. The weight of advantage is clear. The problem for this nation becomes one not of tonnage or man power but of organization and application. In the manner that the great executive and creative minds of America are able to measure up to their supreme test will the answer of peace and victory be framed.



Excess Profits Tax Bewilders Industry

BY GUY F. CREVELING

PRICE fixing has limited the profits possible to the iron and steel and allied industries. War taxes enacted are of equal interest to these industries, for they will determine the amount of these profits which will be retained by the various companies for distribution or investment in their businesses. As time passes and the steel trade has become fully accustomed to the fixed prices, the war taxation will loom more and more in importance. Not long ago business houses looked upon their taxes as a small amount of their expenses, but that time has passed, for years, if not forever. When this war is over the United States will have a national debt that by comparison will make the pre-war debt unworthy of the name. We have assumed a new place among the nations and the obligations of this position will not end with the war, but may call for continued large expenditures. It behooves all business men to consider seriously this new factor in their affairs, not merely with a view to making their returns by next March and their payments by next June, but with the broader thought of future years. Henceforth taxes must be reckoned as one of the most important elements in the cost of doing business. Of course, the imposition of heavy taxes will be accepted without complaint by business men as a necessary part of the immense price we are paying for world liberty, just as other emergency steps taken by the government have met with little opposition on the part of those affected.

A Muddled Situation

WHAT is invested capital? This is the burning question of business just now. Upon it depends the taxes that every manufacturer and business man will pay into the war chest, under the new national revenue law. No two minds agree as to the answer. Great confusion exists. The situation is a fine example of how legislation by compromise muddles. In this article Mr. Creveling tells why legislative revision is imperative and throws all available light upon the obscure points.

Act Anything But Scientific

But though the heavy taxes will be borne cheerfully, there is plenty of room for criticism of the unscientific composition of the so-called "scientific" war revenue act of Oct. 3, 1917. For ambiguities, inconsistencies and inequalities, the excess profits section of this act has seldom been equaled in all the checkered history of American legislation. It took congress six months to frame the law, but the act as it stands was devised in two weeks. Immediately after war was declared in April, the house ways and means committee began work on a war revenue bill. It first considered the excess profits tax plan of Great Britain, which levies 80 per cent on all profits above a normal pre-war average. But the house committee immediately dropped this plan, proposing to tax all earnings above 8 per cent on the capital invested at the rate of 16 per cent, regardless of whether the war had affected favorably or unfavorably earnings of the various businesses. This scheme met with much disapproval from business interests, because it accepted 8 per cent as a fair measure of what any company should earn. The house passed the bill in this form, however, whence it went to the finance committee, which rejected it as unsound. The senate committee held that the tax should be on war profits and proposed that war profits be determined by a comparison with the average earnings of the pre-war years 1911, 1912 and 1913. Under this plan the senate committee proposed to tax the war profits at rates running from 12 up to 50 per cent, according to the respective increases. After debating the bill in this form in the senate, about Sept. 1, the committee suddenly changed its intention and went back to the house plan of taxing all profits above a certain fixed rate on the capital actually invested, fixing the base rate at 10 per cent. About the middle of September the bill went into secret conference where important changes

were hastily made, then was passed by both houses and was signed Oct. 3. As a result, we have a tax law which is a composite of the house idea of taxing all profits, whether they are due to war or not, and the senate theory of a graduated scale of taxes. This act is a compromise between the conflicting house and senate theories, having none of the virtues of either and most of the faults of both.

The framers of the act apparently had in mind the United States Steel Corp., the Standard Oil Co., the Ford Motor Co., and a few other outstanding examples of big business in their calculations, for the law is drawn with little regard for its effects upon the great rank and file of tax payers, some of whom will suffer severely from a literal interpretation of the excess profits section. It is expected to raise $1,200,000,000 by excess profits taxing, out of the total of $2,866,020,000 which is estimated for all the new taxes.

The perplexing features of this section have set a-churning the gray matter of the country's wisest business heads. Corporation managements and lawyers, tax experts, public accountants, bankers and ordinary everyday business men have striven in vain to interpret this legislative puzzle whose elusiveness would have put the sphinx to shame. Most of them have seen flaws in the act but few have been able to tell just what would be their taxes for the year 1917, which, after all, was the real object of their study. The final interpretation of the act as it now stands rests with Daniel C. Roper, the commissioner of internal revenue, who has nicknamed the war revenue act "the Liberty tax", Mr. Roper has been organizing a vast administrative machine to bring into the United States treasury every penny that the law calls for as the old outgrown internal revenue bureau never would have sufficed for the job now on hand. Mr. Roper's decisions are subject to the approval of the treasury department.

The entire theory of the excess profits tax, as enacted, revolves about a single pivot-invested capital. But the definition of "invested capital" in the act is so vague and ambiguous that its meaning is impossible of certain interpretation. Possibly by the time this article is published Commissioner Roper will have issued a complete set of explanations and regulations; it is to be hoped such will be the case so that business men will be able to tell at the end of the year how much they have earned in order that they may adjust their accounts and issue the regular annual statement.

The new excess profits tax is intended to be levied upon income or profits derived from a trade or business. The latter term is all inclusive and is made specifically to include "professions and occupations". The term "occupations" includes salaried positions, with an exception, of course, in favor of federal, state and municipal employes. The tax is, in effect, a graduated levy on the excess of net income over specified graduated percentages of capital. The first of these percentages is what is called in the act "the deduction" and the first tax is 20 per cent of the excess of the net income over this deduction and up to 15 per cent of the invested capital. The deduction is either 7 or 9 per cent or an intermediate percentage of the "invested capital", according to the showing made as to percentage on pre-war capital earned in the pre-war years 1911, 1912 and 1913, inclusive. There is a special addition to this deduction of $3000 in the case of a corporation or of $6000 in the case of a partnership or individual. The remaining graduated tax percentages are based on the excess over the flat named percentages of invested capital without any addition of the $3000 and $6000, respectively.

Where a corporation, partnership or individual was not engaged in the

What is Invested Capital? Here's What the Tax Law Says

AS USED in this title "invested capital" does not include stocks, bonds (other than obligations of the United States), or other assets, the income from which is not subject to the tax imposed by this title, nor money or other property borrowed, and means, subject to the above limitations:

(a) In the case of a corporation or partnership:

(1) Actual cash paid in.

(2) The actual cash value of tangible property paid in other than cash, for stock or shares in such corporation or partnership, at the time of such payment (but in case such tangible property was paid in prior to Jan. 1, 1914, the actual cash value of such property as of Jan. 1, 1914, but in no case to exceed the par value of the original stock or shares specifically issued therefor).

(3) Paid in or earned surplus and undivided profits used or employed in the business, exclusive of undivided profits earned during the taxable year: Provided, that (a) the actual cash value of patents and copyrights paid in for stock or shares in such corporation or partnership, at the time of such payment, shall be included as invested capital, but not to exceed the par value of such stock or shares at the time of such payment, and (b) the good will, trade marks, trade brands, the franchise of a corporation or partnership, or other intangible property, shall be included as invested capital if the corporation or partnership made payment bona fide therefor specifically as such in cash or tangible property, the value of such good will, trade mark, trade brand, franchise or intangible property, not to exceed the actual cash or actual cash value of the tangible property paid therefor at the time of such payment; but good will, trade marks, trade brands, franchise of a corporation or partnership, or other intangible property, bona fide purchased, prior to March 3, 1917, for and with interests or shares in a partnership or for and with shares in the capital stock of a corporation (issued prior to March 3, 1917), in an amount not to exceed, on March 3, 1917, 20 per centum of the total interests or shares in the partnership or of the total shares of the capital stock of the corporation, shall be included in invested capital at a value not to exceed the actual cash value at the time of such purchase, and in case of issue of stock therefor not to exceed the par value of such stock;

(b) In the case of an individual.

(1) Actual cash paid into the trade or business.

(2) The actual cash value of tangible property paid into the trade or business, other than cash, at the time of such payment (but in case such tangible property was paid in prior to Jan. 1, 1914, the actual cash value of such property as of Jan. 1, 1914).

(3) The actual cash value of patents, copyrights, good will, trade marks, trade brands, franchises or other intangible property, paid into the trade or business, at the time of such payment, if payment was made therefor specifically as such in cash or tangible property, not to exceed the actual cash or actual cash value of the tangible property bona fide paid therefor at the time of such payment.

In the case of a foreign corporation or partnership, or of a nonresident alien individual the term "invested capital" means that proportion of the entire invested capital, as defined and limited in this title, which the net income from sources within the United States bears to the entire net income.

trade or business during the whole or any one of the pre-war years, income up to 8 per cent on the present invested capital is not taxed. The rate of pre-war income makes but little difference in any event in the amount of the tax, as the deduction is limited between 7 and 9 per cent and is used only in computing the war profits tax up to 15 per cent. This labored requirement of a comparison of net earnings and invested capital in the pre-war period with net earnings and invested capital in the taxable year, is ridiculous. To compute a possible difference of 2 per cent, a ponderous method has been provided, which has attracted more attention than it really deserved and has confused many business men, not only as to itself, but as to the whole law. This part of the act was the sop thrown out by those who favored taxing profits generally, to those who favored taxing only profits which had been increased by the war.

The graduations of the tax vary according to the per cent earned upon the capital invested as follows: On the first 15 per cent or less earned on the capital (less the exempted income and the $3000 or $6000 deduction) the tax is 20 per cent; on the next 5 per cent or less (profits 15 to 20 per cent) the tax is 25 per cent; on the next 5 per cent or less (profits 20 to 25 per cent) the tax is 35 per cent; on the next 8 per cent or less (profits 25 to 33 per cent) the tax is 45 per cent; and on the remaining income (all over 33 per cent) the tax is 60 per cent.

Representative Fordney, of Michigan, ranking Republican of the house ways and means committee, in order to demonstrate the workings of the excess profits tax and show the differences between the taxations on corporations, partnerships and individuals, had an example of each incorporated in the *Congressional Record*. These examples assume the same capital and net income for all:

FOR CORPORATIONS

(a) Corporation with capital of $100,000 and net income of $50,000.

Deducting from net income 9 per cent of the capital, the maximum deduction, plus $3000, or total deduction of $12,000, shows the taxable income to be $38,000.

Tax on amount in excess of deduction and not over 15 per cent of capital —$3000 at 20 per cent	$600
Tax on amount of profit in excess of 15 per cent of capital and not over 20 per cent—$5000 at 25 per cent	1,250
Tax on amount in excess of 20 per cent of capital and not over 25 per cent—$5000 at 35 per cent	1,750
Tax on amount in excess of 25 per cent and not over 33 per cent of capital—$8000 at 45 per cent	3,600
Tax on amount in excess of 33 per cent of capital—$17,000 at 60 per cent	10,200
Total excess profits tax	$17,400
Net income	50,000
Excess profits tax	17,400
Net income subject to income tax— $32,600 at 6 per cent	1,956
Total tax	$19,356

FOR PARTNERSHIPS

(b) A partnership of three parties with a capital of $100,000 and net income of $50,000.

Deducting from net income 9 per cent of capital invested, plus $6000, or a total deduction of $15,000, shows the taxable income to be $35,000.

Tax on amount of income in excess of deduction and not over 15 per cent of capital	.....
Tax on amount of income in excess of 15 per cent but not over 20 per cent of capital—$5000 at 25 per cent	$1,250
Tax on amount of income in excess of 20 per cent but not over 25 per cent of capital—$500 at 35 per cent	1,750
Tax on amount of income in excess of 25 per cent but not over 33 per cent of capital—$8000 at 45 per cent	3,600
Tax on amount of income over 33 per cent of capital—$17,000 at 66 per cent	10,200
Total excess profits tax	$16,800
Net income	$50,000.00
Less excess profits tax	16,800.00
Income for distribution	33,200.00
Share for each partner	11,067.00
Income tax for each partner:	
$9067 at 2 per cent	181.34
7067 at 2 per cent	141.34
2500 at 1 per cent	25.00
2500 at 2 per cent	50.00
1067 at 2 per cent	32.01
Total for each	429.69
Total for all three	1,289.07
Total tax	$18,089.07

FOR INDIVIDUALS

(c) Individual engaged in business with capital of $100,000 and net income of $50,000.

The excess profits tax would be the same as on a partnership, which is shown above to be $16,800.

Net income	$50,000
Deduct excess profits tax	16,800
Income subject to income tax	33,200
Income tax of individual on $33,200:	
$31,200 at 2 per cent	$624
29,200 at 2 per cent	584
2,500 at 1 per cent	25
2,500 at 2 per cent	50
2,500 at 3 per cent	75
2,500 at 4 per cent	100
5,000 at 5 per cent	250
13,200 at 8 per cent	1,056
Total income tax	$2,764
Excess profits tax shown above	$16,800
Add total income tax	2,764
Total tax	$19,564

Apparently the deductions of 7 to 9 per cent plus $6000 or $3000, as the case may be, are to be made only in computing the taxable income up to 15 per cent. Thus, any business earning over 15 per cent is subject to the higher rates of taxes on the excesses even though its total net income may be less than the deductions specified. For example, in the case of a corporation with a capital of $20,000 and a net income of $4400, or 22 per cent, which earned 8 per cent in the pre-war period, the total deduction would be $4600 (8 per cent plus $3000), or $200 more than the total income. Yet the corporation would be taxed $390, as follows:

On $3000 (15 per cent) less $4600 At 20 per cent rate	$...
On $1000 (15-20 per cent) Taxed at 25 per cent	250
On $400 (20-22 per cent) Taxed at 35 per cent	140
	$390

There are many who believe that congress really intended to apply the scale of taxes to the income remaining after the deductions had been subtracted. Thus in the case of the $100,000 corporation instanced by Mr. Fordney, the taxation would have applied only to $38,000 of income, which would have made the total excess profits tax $12,600, instead of $17,400.

Invested Capital the Crux

The basis of the excess profits tax being the relation of net income to invested capital, the key to the tax thus is seen to rest in the definition of the term "invested capital". The definition of invested capital in the act is only the skeleton upon which will be built a complex structure of decisions, rulings and practice. As one authority says, "It supports and gives general form to that structure when completed but is just as impossible to forecast from examination of a new tax schedule, the exact things that will happen in ruling and practice as it is to determine from examination of a human skeleton whether the deceased had red hair, or blue eyes, or wore whiskers, or had corns, or liked ginger ale with his Scotch."

In just the same way, it depends upon the views of the commissioner of internal revenue and the treasury department what will be regarded as invested capital in the computing of excess profits taxes. An advisory commission of business men has been selected to aid the commissioner in arriving at a decision on this point. It is not clear just why congress should frame a measure which must immediately entail the formation of a commission to interpret.

Although we are not told what invested capital is, we are explicitly told some things which it is not. We know, for example, that it does not mean the whole amount of money or property employed in a business. A company which began with a paid-in

capital of $100,000 and which has a surplus of $25,000 and undivided profits carried into the taxable year of $5000, has an invested capital of $130,000. It may also have an outstanding bond issue of $50,000, and so has $180,000 actually employed in the business. But the law plainly states that borrowed money is not capital and cannot be used as such in computing the rate of net earning. Neither can such excess. This ruling is based on the definition of the terms "trade" or "business" previously mentioned. According to the report, the treasury department holds that the term "occupation" fits every salaried person except those specifically exempted, notably the members of congress who passed the law. The weakness of such a clause is evident.

In case a trade or business has no the act, it is subject, in addition to lower graduated taxes, to a tax of 60 per cent on everything in excess of $3300. If the treasury department rules the capital nominal the tax drops from 60 per cent to 8 per cent.

If the commissioner of internal revenue is unable in any case to determine satisfactorily the invested capital, the law provides that "the amount of the deduction shall be an

Government Taxes Levied Against a Sole Trader (Married)

Capital invested $150,000
Net profits for taxable year..... 100,000

					Tax law of Sept. 8, 1916, amended Oct. 3, '17	Excess-profit tax, Oct. 3, '17	Total tax
Net profits	$100,000						
Less exemptions	4,000						
Taxable profits	$96,000	Normal tax, Law 1916.....	2	per cent	$1,920		
Subject to additional tax....	$20,000	Additional tax, Law 1916.....	1	per cent	200		
	20,000	Additional tax, Law 1916.....	2	per cent	400		
	20,000	Additional tax, Law 1916.....	3	per cent	600		
	20,000	Additional tax, Law 1916.....	4	per cent	800		
Total	$80,000					——	$3,920
War income tax, 1917:							
Net profits	$100,000						
Exemption	2,000						
Taxable profits	$98,000	Normal tax, Law 1917.....	2	per cent	$1,960		
Subject to additional tax....	$2,500	Additional tax, Law 1917.....	1	per cent	25		
	2,500	Additional tax, Law 1917.....	2	per cent	50		
	2,500	Additional tax, Law 1917.....	3	per cent	75		
	2,500	Additional tax, Law 1917.....	4	per cent	100		
	5,000	Additional tax, Law 1917.....	5	per cent	250		
	20,000	Additional tax, Law 1917.....	7	per cent	1,400		
	20,000	Additional tax, Law 1917.....	10	per cent	2,000		
	20,000	Additional tax, Law 1917.....	14	per cent	2,800		
	20,000	Additional tax, Law 1917.....	18	per cent	3,600		
Total	$95,000					——	12,260
War excess-profit tax:							
Taxable profits	$3,000	Additional tax, Law 1917.....	20	per cent		$600	
Subject to additional tax....	7,500	Additional tax, Law 1917.....	25	per cent		1,875	
	7,500	Additional tax, Law 1917.....	35	per cent		2,625	
	12,000	Additional tax, Law 1917.....	45	per cent		5,400	
	50,500	Additional tax, Law 1917.....	60	per cent		30,300	
Total	$80,500					——	40,800
							$56,980

profits accumulated during the year and actually employed in the business be treated as invested capital. If new capital is invested during the year, the company will get the benefit of it, in determination of the rate of net earnings only for that part of the year elapsing after its investment. The invested capital is to be averaged monthly and the average for the year is used in computing the earnings rate.

According to reports of unofficial rulings of the treasury department, the law will compel all persons receiving a salary in excess of $6000 per annum to pay a tax of 8 per cent on invested capital, or only a nominal capital, the act provides for a tax of 8 per cent on the income of such business in excess of a deduction of $3000 in the case of a corporation and $6000 in the case of a partnership or individual. This brings up rather a nice point. Some firms have a moderate capital in money while their real capital is their brains, experience and organization. It will be up to the commissioner of internal revenue to decide whether or not their capital is nominal. The Blank Co. may have an invested capital of $10,000 and a net income of $20,000. According to amount equal to the same proportion of the net income of the trade or business received during the taxable year as the proportion which the average deduction, without including the $3000 or $6000 deduction, for the same calendar year of representative tax payers engaged in similar business, bears to the total net income of the trade or business received by such corporations, partnerships and individuals, plus in the case of a domestic corporation $3000 and in the case of a domestic partnership or a citizen or resident of the United States, $6000."

From the language of the act's def-

inition of invested capital it seems to have been the original intention of the framers to allow the full original investment value of property. However, as this would undoubtedly mean the valuation of properties acquired many years ago and would in most cases be impossible, the provision has been inserted that if the property were acquired prior to Jan. 1, 1914, it should be valued as of that date. No provision is made for the many changes in character of the original property occurring prior to that date nor for the frequent case where the original property has disappeared. The taxation committee of the Investment Bankers' association makes this comment:

"It is plainly impossible for the government to determine the valuation of tangible property acquired many years ago, and if it is to allow substitution of new properties for old, the result will be a determination of the actual 1914 values, which is just what the act does not apparently intend to allow. The original properties would, in the average case, be intermingled with the properties purchased for cash and would represent the investment of cash or undivided profits by way of replacement and improvements. If the act is to be enforced in its present form, the department and the courts will be, in a sense, compelled to find a 'way out' of this difficulty, probably by allowing as 'paid in or earned surplus and undivided profits' everything not otherwise credited that has gone into property and is in fact capital. This, we are inclined to think, is the most practical interpretation of the act.

"There are many other complications and difficulties affecting the inclusion or exclusion of patents, good will, etc. Throughout there is a combination of the two ideas of 'invested capital' and actual capital, which makes any responsible application of the definition illusive and in some cases almost impossible. Some of the effects of the law are all but incredible. The measure as a whole and in its present form represents the hurried and secret work of the conferees laboring under serious handicaps and is very far from representing the ability of the members of the house and senate committees responsible for it. Certainly many of its actual defects were never intended by any thinking member of congress whose wish it is to further the interests of the country at this time."

The committee proceeds to point out that a mercantile partnership of three members having an invested capital of $10,000 and a net income of $15,000—not an unusual situation in

Figuring the Steel Corporation's Taxes

By Standard Statistics Co., New York

		Average for years 1911-13
(1)	Actual cash paid in:	
	Cash surplus provided at organization	$25,000,000
(2)	Actual cash value of tangible property paid in at organization for stock of shares:	
	Valuations of tangible properties acquired at organization, as indicated in the report of the commissioner of corporations of the federal government on "The Steel Industry"	$682,000,000
	Appropriated for capital expenditures	215,494,424
(3)	Earned surplus of undivided profits used or employed in the business exclusive of undivided profits earned during the taxable year:	
	Profit and loss surplus	$119,850,200
	Total	$1,042,344,624
	Deduct funded debts—outstanding	634,188,222
	Estimated capital invested	$408,156,402

Estimated Capital Invested—Taxable Year

Cash surplus provided at organization	$25,000,000
Valuation of tangible properties acquired at organization, as indicated in the report of the commissioner of corporations of the federal government on "The Steel Industry"	682,000,000
Appropriated for capital expenditures	225,494,424
Profit and loss surplus (Dec. 31, '16)	356,360,913
Total	$1,288,855,337
Deduct:	
Funded debt outstanding Dec. 31, 1916	629,298,873
Estimated capital invested	$659,556,464

For purposes of demonstrating the effect of the law, let it be assumed that the basic figures for consideration in computing the taxes are as follows:

	Capital invested	Annual net income	Per cent earn. on capital
Taxable year (1917)	*$660,000,000	†$450,000,000	68.2
Average for pre-war period 1911-12 and 1913	408,156,402	63,585,777	15.6

*Estimated capital invested as of July 1, 1917.

†Estimated net income for year to end Dec. 31, 1917.

The average pre-war profit of $63,585,777 is 15.6 per cent of the $408,156,402 indicated average capital investment for the pre-war period, so that under the terms of the law a maximum of 9 per cent of the estimated capital invested in the taxable year may be deducted from the $450,000,000 estimated net income for the taxable year to determine war profits.

Accordingly the excess war profits taxable are computed on this basis:

Estimated net income for taxable year	$450,000,000
Deduct:	
9 per cent of $660,000,000 capital invested	59,400,000
Balance	$390,600,000
Special exemption to corporations	3,000
Taxable war profits	$390,597,000

The taxable war profits of $390,597,000 are subject to a graduated scale tax as hereinafter indicated:

		Taxes
20 per cent on (15 per cent of $660,000,000 capital invested, less an exemption of $59,403,000 as above determined)	$39,597,000	$7,919,400
25 per cent on amount between 15 and 20, or 5 per cent	33,000,000	8,250,000
35 per cent on amount between 20 and 25, or 5 per cent	33,000,000	11,550,000
45 per cent on amount between 25 and 33, or 8 per cent	52,800,000	23,760,000
60 per cent on balance	232,200,000	139,320,000
Total	$390,597,000	$190,799,400

According to the above computation the excess war profits tax is computed as $190,799,400, which deducted from the estimated net income for the year, $450,000,000, leaves a balance of $259,200,600, on which sum there is to be levied the normal income tax of 2 per cent and the war income tax of 4 per cent thus making additional taxes of 6 per cent amounting to $15,552,036.

Upon this basis of computation the estimated tax obligations of the United States Steel Corp. would be approximately $206,000,000. This result is based upon a continuance of profits during the fourth quarter at about the same rate as prevailed during the nine months ended Sept. 30, 1917.

any part of the country—is taxed $7,680, more than half the earned income of the members. On the other hand, there are many cases where the government would fail to get the anticipated tax. A concern with $10,000,000 paid in, say in 1905, whose capital has been reduced by losses to only $1,000,000, the stock of which has been bought in 1915 for $900,000, is taxed on a capital basis of $10,000,000 and has apparent immunity from the tax on income up to $700,000 a year.

Some people are of the opinion that corporations' balance sheets will be used to indicate their invested capital. Others believe that the prices of stocks on Jan. 1, 1914, will be taken to indicate the property values on the date. Still others believe a physical valuation of property will be necessary. The managements of most of the leading steel companies frankly admit they don't know what their taxes will be for 1917. But they are, as a rule, laying aside amounts which they hope will cover these charges. For example, the Republic Iron & Steel Co., for the nine months ending Sept. 30, 1917, earned net profits of $21,681,000, from which the reserve deducted for the new taxes was $8,636,000, or a little less than 40 per cent. The Pittsburgh Steel Co., for the fiscal year ended June 30, 1917, reported net operating profit of $9,663,938, and its war profits taxes were put at $1,823,540, or 18 per cent, although, of course, these taxes are on earnings of only six months. The Superior Steel Co., for the eight months ended Aug. 31, 1917, had a net income of $2,099,372, while the reserve for excess profits taxes was $577,947, or 27 per cent. The Carbon Steel Co. earned $2,244,745 net, of which it set aside $1,211,423 for federal income and excess profits taxes. The Lackawanna Steel Co., in its report for the first nine months made no provision for excess profits taxes, owing to the uncertainty of computing these. The United States Steel Corp. laid aside approximately $164,000,000 during the first nine months of 1917.

There have been a good many guesses as to what the Steel corporation will be assessed as excess profits taxes this year, some of which differed as much as $75,000,000; its allowances, however, for the first three quarters of 1917 lead to the belief that the corporation expects its tax will be about $240,000,000 for the entire year.

Several other taxes imposed by the war revenue act are worthy of attention, including the tax of 10 per cent on capital not invested in the business, unless invested in government securities, which provision is intended to stimulate purchases of Liberty bonds; tax on promissory notes; tax on drafts not payable at sight; tax on new issues of capital stock or transfers; tax on power of attorney and proxy, and various others. These taxes are couched in fairly explicit language, as is also the war income tax, which is in addition to the rates levied by the income tax law of 1916. It is interesting to note that the war revenue act, in connection with the flat 6 per cent rate on profits provided by the income taxes, indicates the following exemption:

"That in assessing income tax the net income embraced in the return shall also be credited with the amount of any excess profits tax imposed by act of congress and assessed for the same calendar or fiscal year upon the taxpayer and, in the case of a member of a partnership, with his proportionate share of such excess profits tax imposed upon the partnership."

Taxes May Have Been Spent

How the new tax would work injustice in some cases is indicated by a table worked out by William H. Dennis, certified public accountant, 37 Nassau street, New York. This table is published herewith, showing that a sole trader with an invested capital of $150,000 would have to pay a tax of $56,980 on profits of $100,000.

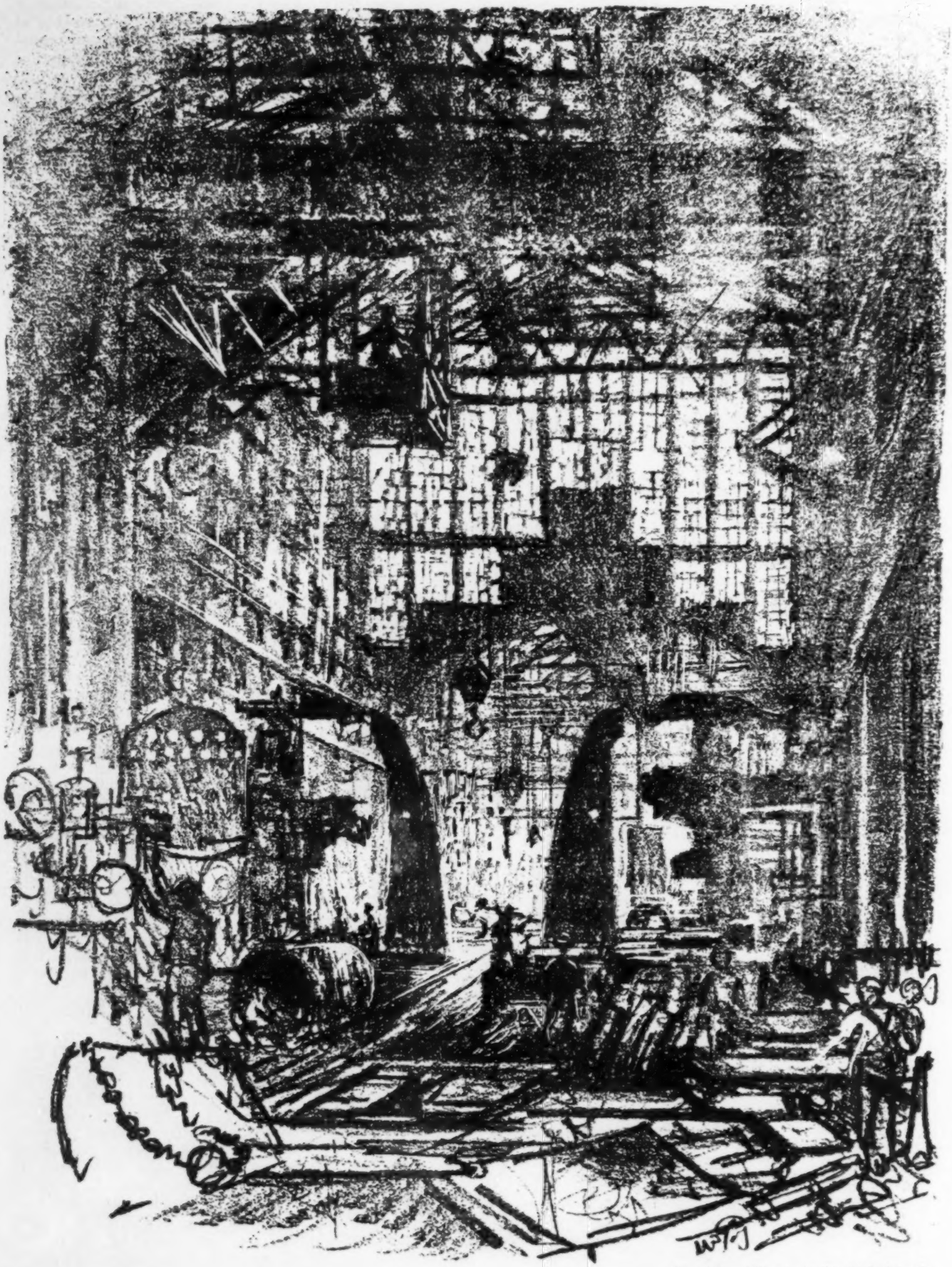
This absurd legislation could not be better designed if drawn purposely with a view to destroying business and cutting down production. It includes a series of paragraphs and sections which do not mean what they say and say any number of things they do not mean and are capable of scores of different constructions. One able lawyer says upwards of 100 decisions will be necessary before the excess profits section can be straightened out. The board of excess profits advisors must attack the confusion centering about invested capital and pass along its conclusions to the secretary of the treasury, who in turn must issue instructions to the collectors, who will use their judgment in individual cases. It is inevitable that a great many injustices and inequalities will be the result.

There is only one way out of such a muddle, one safe and sane solution to the puzzle. This is the repeal of the law, and the passage of a new one framed by experts on sound economic lines. Congress is now in session and perhaps by the time these lines are printed will have taken such action. If not, it is the duty of every business man to himself bring such pressure and influence as he can to bear to persuade congress to provide a new war revenue act.

None Will Be Allowed to Escape Tax

NO general tax in the history of this or any other country will be administered with more organized care and effort than the war revenue measure, according to Daniel C. Roper, United States commissioner of internal revenue, who will direct its collection. The field force of the revenue bureau is to be greatly expanded for this purpose. Schools of instruction are to be held in every collection district; and revenue officials are to be sent into every county in the United States to render advice and help taxpayers to make out their returns. Every means will be utilized to inform taxpayers as to the amount for which they are liable and how, when and where payments should be made. A board of nine leading business men has received and studied the views of general business on the excess profits clause and will render advice to the government along this line.

DANIEL C. ROPER



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"THE RIVETERS," A DRAWING BY JOSEPH PENNELL

Will There Be Enough Ship Steel?

A Study of the Fabricated Ship Problem From the Steel Manufacturer's Standpoint —What the Shipbuilding Program Means When Translated Into Rolling Mill Schedules

BY E. C. KREUTZBERG

A PROMINENT steel fabricator has stated that whereas in England modern building and structural operations were developed largely through experience gained in shipbuilding, this order has been exactly reversed in this country. Here standardized shipbuilding methods are being evolved through the instrumentality of the craftsmanship which years ago elevated bridge and structural fabricating to the level of a fine art. For years dreamed of by a few engineers whom old-line shipbuilders were inclined to look upon as visionaries, the standardized ship is the child of a dire emergency which it was impossible to meet by ordinary methods. As long as the United States remained a neutral observer of the war, stimulation of shipbuilding in this country was entirely a matter of private initiative. With our entrance into the war, the shipbuilding industry at once became one of the country's principal offensive and defensive arms, since it was clear that without an abundance of ships, we could transport neither troops nor supplies. As a result of this vital need, shipbuilding methods are being revolutionized. In fact, this industry, under the urge of war, is undergoing progress almost over night which it undoubtedly would have required many years of prewar conditions to develop.

Ships to Win the War

LLOYD GEORGE says, "Ships will win the war." Ships to win the war are now being turned out in almost every port all around the coast from Maine to Washington, while on the Great Lakes one concern alone has contracts for 70 canal-size steamers for 1918 delivery. This tremendous program means much to the American steel industry. Will there be steel enough to go around? In this article Mr. Kreutzberg answers, "yes" emphatically, and tells you why. The American steel industry can carry the burden of war in ships, as well as in guns, munitions and countless other directions.

What the Average Man Sees

Of the tremendous shipbuilding activity now vibrant throughout the country, participated in by hundreds of industries and thousands of workers, the average man sees only what is visible on the surface. Of the records which are broken daily in the construction of the vessels, and in the production of the materials entering into their construction, he has only a hazy idea. For instance, on Dec. 4, the Federal Shipbuilding Corp. laid its fifth keel at its yard near Newark, N. J., on a site which only some two months before, had been unoccupied meadow land. On Nov. 21, this company riveted into its initial hull the first plate rolled by the new Liberty mill of the Carnegie Steel Co. at the Homestead works, Pittsburgh. The Liberty mill, incidentally, is typical of the almost superhuman efforts the steel industry is making in its endeavor to sustain the shipbuilding program. When the construction of this mill was authorized on April 17, no pencil had been put to paper in making preliminary estimates or designs and no parts or supplementary machinery were available. By the employment of steam shovels for practically all excavating work; by the use of special trains for transporting parts which required attention at other plants, and through the patriotism of skilled workmen and office men who voluntarily gave up their Saturday half holidays, their Sundays and their evenings to do work which the scarcity of common labor otherwise would have greatly delayed, it was possible to rush the mill to completion in record time. In fact, it began actual production of plates for the government on Oct. 17.

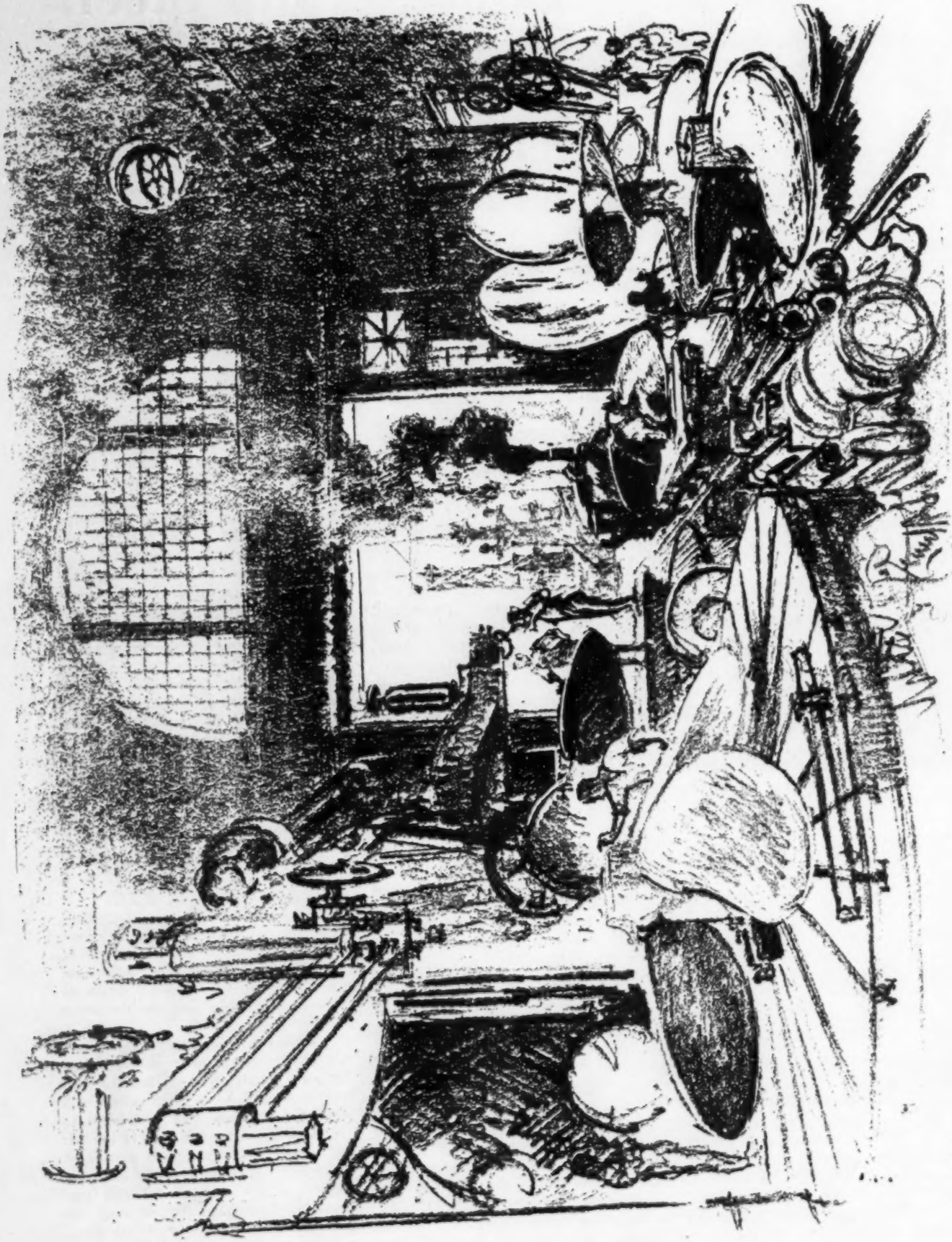
The decision to carry out by far the major portion of our shipbuilding program in steel, meant not only the stimulation of every branch of the steel industry whose service is essential in this work, but the decision itself was made possible by the existing capacity and efficiency of the industry as a whole. That the steel industry's production will keep well in advance of shipbuilding requirements, appears certain.

For instance, a standard cargo carrier, 9000 tons deadweight, such as is being constructed by the Chester Shipbuilding Co., and the Merchant Shipbuilding Corp., requires 2123 net tons of plates, 771 tons of shapes and 93 tons of bars and miscellaneous steel, making a total of 2987 tons; in addition, some 145 tons of rivets are required. A 9400-ton deadweight vessel, of the type which is being built by the Federal Shipbuilding Corp., requires 2060 tons of plates, 900 tons of shapes and 22 tons of bars and miscellaneous steel, making a total of 2982 tons; in addition 143 tons of rivets are required. For a 5000-ton vessel, some 1700 tons of steel, not including the rivets, are required, with plates, shapes and bars in approximately the same ratio as for the larger vessels. As shown by these figures, the net tonnage of steel required per vessel, depending on the type, varies from 31 to 34 per cent of the figure representing the deadweight tonnage, the percentage increasing inversely as the size of the boat. For each deadweight ton of standardized steel shipping, therefore, approximately 687 pounds, or 0.3435 ton of steel are required, of which 65 to 68 per cent are plates, 24 to 29 per cent shapes, 3 per cent or less bars and miscellaneous steel, and 4 to 5 per cent rivets.

Huge Tonnage by March

Composite vessels, neglecting the rivets, bars, and miscellaneous steel, may be estimated as requiring per deadweight ton, 0.2246 tons of steel, of which 61 per cent are shapes and the remainder plates.

It is stated by authorities who have carefully analyzed the possibilities that by next March steel shipbuilding will have developed to a point which will permit of the launching of 240,000 to 250,000 deadweight tons per month. It will not be until the fourth quarter of 1918 that our capacity will have increased to the rate of 6,000,000 tons annually. Launchings of new steel vessels during 1918, it now is calculated, will not be in excess of 3,400,000 deadweight tons. In addition to the steel



"MAKING PROPELLER BLADES," A DRAWING BY JOSEPH PENNELL

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vessels, it is likely that at least 150,000 deadweight tons of composite ships will be launched during 1918. It is on these figures that calculations of the amount of steel to be required in 1918 in carrying out the shipbuilding program must be based. For the steel vessels, approximately 1,168,000 net tons of steel will be required. For the composite vessels, approximately 33,700 tons of steel will be required. The total, therefore, is 1,201,700 tons, of which about 778,000 tons are plates and 330,000 tons shapes.

In sheared and universal plates in dimensions which are suitable for shipbuilding, the country's capacity now is at the rate of 2,800,000 to 3,000,000 tons, and it conservatively may be estimated by reason of new plate mills which are under construction, that by the fourth quarter of 1918, the capacity of such plates will be between 3,500,000 and 3,600,000 tons. After deducting 778,000 tons as representing the requirements for our merchant shipbuilding program during 1918, at least 2,400,000 tons of such plates will be left out of the 1918 production to take care of other demand. Large quantities will be required for various military requirements of the United States, such as the construction of cars, locomotives, tanks, trench bombs, etc., and it is likely that our active allies will endeavor to secure at least 1,000,000 tons of ship plates here during 1918. Therefore, while the fulfillment of the shipbuilding program will require a much smaller percentage of the output than has been expected, war requirements generally, according to well informed estimates, will account for fully 75 per cent of the output of plates suitable for shipbuilding. Incidentally, the plate output which reasonably can be expected during the next twelve months, would be sufficient, were it devoted exclusively to shipbuilding, for the creation of more than 14,000,000 deadweight tons.

Three Kinds of Shipbuilders

Standardized and fabricated are entirely synonymous terms when applied to the majority of vessels now being built for the government. The essential feature of standardization is the adoption of designs which eliminate curves wherever possible, thus enabling fabricating shops to furnish the larger portion of the hull steel. The ideal condition in standardization is found where shipyards, like the American International Shipbuilding Corp. and the Submarine Boat Corp. devote themselves entirely to assembling fabricated steel into complete vessels. So far this state of advancement has not entirely passed the period of organization. Shipyards in this country now fall into three clearly defined groups. The first includes established shipbuilding plants which have their own facilities for completely fabricating the plates and shapes needed. These plants are dependent on the steel industry only for plain material as it comes from the mills. The second group includes yards such as those of the Chester Shipbuilding Co., the Federal Shipbuilding Corp., the Merchant Shipbuilding Corp. and the Newburgh Shipyards, which have their own facilities for fabricating the bow and stern sections and other parts which have to be warped or where the opening or closing of angles is necessary. These yards rely on outside fabricating plants for other fabricating work, which constitutes all the way up to 88 per cent of the steel required for the vessels they are building. The third group of shipbuilders, already alluded to, embraces purely assembling organizations depending on outside shops for all of the steel required.

At least some or all of the fabricators who furnish material to the third group must be provided with all of the equipment necessary for handling this steel. The tools that are required include single and multiple punches, plate planers, shears, beveling shears, scarfing machines, drilling, reaming and countersinking apparatus, while for curved work, bending rolls and presses, and bending slabs for bending the flanges of channels and angles. Also for bending plates for the bow and stern, presses for bending shapes, special heating furnaces, etc., are needed. Only a few of the best equipped shops so far have undertaken the curved work.

The principal tool employed in fabricating ship steel, in fact, the tool which old-line shipbuilders regarded as practically valueless for their work, but which has proved a major factor in making the present speeding-up process possible, is the multiple punch. An idea of the punching which is necessary is conveyed in a recent statement by Homer L. Ferguson that a 7500-ton fabricated ship requires about 650,000 rivets, which means at least 1,300,000 holes for rivets alone. The multiple punch

Photograph by International Film Service

LAYING THE KEEL FOR A STANDARDIZED STEEL SHIP

does in a moment what would require minutes with the single punch. By adapting the spacing of holes to the same multiple, the punch spindles can be set permanently and after that it simply is a matter of constant repetition of the same operation. When the holes are too close together to be punched at one stroke, the spacing is arranged so that an additional stroke will suffice.

The difficulties encountered in the construction of the fabricated vessels result almost entirely from the lack of familiarity with such work which is prevalent outside of shipbuilding establishments. It is contended that any shop which can fabricate bridge and structural steel can concentrate its activities on the fabrication of ship steel. This contention appears to be well founded, since fabricating shops which only a few weeks ago accepted contracts for ship work with a good deal of apprehension are finding it to be less difficult than they anticipated. The extent to which fabricators may participate in shipbuilding is shown by the fact that in some cases they have even their own mold lofts for laying out hulls completely or in parts, in order to make their own drawings and templates. The present bridge and structural shop capacity of this country is rated at 180,000 tons per month, or 2,160,000 tons per year. This figure is equivalent roughly to some 6,288,000 deadweight tons of shipping. Considering the steel which will be fabricated at the self-contained and partly self-contained shipyards, the fabricators will probably have a comparatively easy time of it.

In brief, the great iron and steel industry of the United States is already organized and equipped to meet any demands our war shipbuilding program may require.

A contract has been awarded by the government to the Wolverine Brass Works, Grand Rapids, Mich., for $400,000 worth of brass airplane parts.

Employes Have Mutual Insurance Society

The General Electric Co. at its several plants has encouraged a system of mutual insurance at small cost to employes. Briefly stated, the protection consists of a death benefit and a weekly indemnity while sick or disabled. The death benefit paid out of the treasury of the mutual benefit association is $100, but the General Electric Co. supplements this by another payment of $100, thus making the death benefit $200. This is payable at once in cash to the beneficiary of the deceased member.

The weekly disability payment in case of sickness is $6 per week for men and $5 per week for women. Payment is continued for 14 weeks, during any 12 consecutive months. In all periods of disability members are excused from paying dues. A visiting committee is formed in each case to call upon the sick member and in many cases the company's nurse calls upon the patient.

The cost of this triple protection against death, sickness and accident varies from nothing a year in some sections, up to a maximum of $5.20 per year. The cost per member averaged $4.07 at Lynn in 1916; and the average at Schenectady was but $3.97 in 1917.

Membership begins with the payment of an initiation fee of 50 cents and the first week's dues of 10 cents. Thereafter, 10 cents is payable and collected every week in advance and no member can be obliged to make any further contribution. This payment is suspended altogether for shorter or longer periods when the section treasury shows a balance of $300 or more.

These dues or premiums are payable to collectors chosen from the membership of the association, and it is obvious that the insurance for this reason may be provided at a rate which would be without profit to an outside corporaton. In addition to the dues from members, the association has other small sources of income, principally the annual field days. The receipts from these field days are turned into the treasury of the mutual benefit association. Dances are held from time to time and other entertainments, more or less impromptu in their nature, assist in swelling the treasury fund and in reducing the dues paid by the members. These events meet with hearty response from the members. The total of death and sick benefits in the various factories of the General Electric Co. approximate $100,000 per year. The amount of life insurance carried by all these associations is over $4,500,000.

Photograph by International Film Service

DRIVING THE FIRST RIVET IN A STANDARDIZED STEEL CARGO CARRIER

Utah Ore Deposits

The United States geological survey, department of the interior, has on hand a few copies of the professional paper 80, on the geology and ore deposits of the San Francisco and adjacent districts, Utah.

The valuable minerals in the San Francisco and adjacent districts are described and illustrated, and their nature, origin, and commercial importance are fully discussed. The Rollins mine, the first mine opened in Utah, was in the San Francisco district. This mine produced a few tons of lead bullion, but the discovery of the Horn Silver mine in 1875 brought the San Francisco district into prominence and resulted in the extension of the Utah Southern railroad. Beaver county, in which the San Francisco district lies, produced from 1860 to 1916 gold, silver, copper, lead, and zinc valued at $47,211,876. About 70 per cent of this amount represented ore mined in the San Francisco district.

Washington Bossing Steel Industry

Sweeping Control of Sale and Distribution of Mill and Furnace Products Now Exercised by Government as War Measure Brings Nation-Wide Adjustment of Manufacturing Enterprise and Other Fundamental Changes

BY C. J. STARK

"NOTHING to do." This phrase could be framed and hung appropriately in hundreds of sales offices in the iron and steel industry just now. Applied literally to the full round of office routine with its hundred and one details, it is, of course, a mere figure of speech. If anything, the troubles of the sales department over delays in deliveries, errors of shipments, complaints over quality, specifications, etc., all of which are symptoms of an extraordinary condition of business, have been compounded. But it does fitly describe the state of affairs in the booking of and the competition for new orders which is grist for the sales office and without which the latter is as functionless as the mill wheel with no water to turn it.

All this means that the government is in the saddle in the iron and steel business, completely and absolutely; that the law of supply and demand for the present is nonexistant; and that the distribution of mill and furnace products is proceeding along strange lines. The seat of authority in the industry no longer resides at plant headquarters in Pittsburgh or Chicago, South Bethlehem or Birmingham, but finally in Washington. The capital city, without a pound of iron and steel being made within its corporate limits, has become the chief city of the nation in the iron and steel business.

Market in New Era

This new market era in the iron and steel industry was inaugurated Sept. 24, 1917. On that date President Wilson announced his official approval of an agreement between the war industries board and representative iron and steel manufacturers whereby the government, its allies, and the general public were to be supplied at a greatly reduced level of prices. The new schedule was made subject to revision Jan. 1. Compared with the open market that had prevailed the fixed maximum prices represented a drastic piece of economic surgery. Tank plates had been selling up to $240 per ton; they were now to be furnished at $65 a ton. Structural shapes were cut from $90 to $50 per ton; steel bars from $90 to $58; coke from $12 to $14 in the spot market to $6 and $7, ovens; and pig iron was dropped from $55 and $60 to $33 and $33.60, furnace.

The President's announcement made it manifest that the whole market structure of iron and steel was about to be rebuilt from the ground up to specifications dictated by the law of necessity, not of economics; and that every primary, intermediary and finished product of the industry was to be brought in line with the arbitrary base levels fixed on raw and leading mill materials. Overshadowed by such a program, without precedent and of far-reaching possibilities, the iron and steel market did the expected thing when the significance of the President's statement was grasped quickly by the trade. It simply stopped. Material offered for sale was withdrawn. Buyers, who a few days before had been willing to pay almost any figure to obtain tonnage, nullified their inquiries as fast as the telegraph and telephone could perform their parts. Confusion and uncertainty generally prevailed. Then, after a few days, the market began gradually to square itself with the new conditions.

Regulation More Than Price Fixing

As the market struggled to reestablish itself, the mills and furnaces found that government regulation meant much more than the mere fixing of maximum selling prices. Not only did the federal authorities aim to limit the line of price beyond which sales were to be discountenanced, but to a great extent they prescribed the channels that distribution should take.

Inseparably linked with the price fixing program of the government, has been the establishment of a general system of priority in the satisfaction of requirements. In substance this determines the order and the extent to which each buyer shall obtain manufacturing material in accordance with the importance of his product as a necessity of a war period. All demands have been divided into three chief classes, A, B and C. All A material pertains to direct war needs of the government and its allies, B material to indirect war needs, and

Fixed Price Schedule

PIG IRON

At Furnace

No. 2 foundry	$33.00
Basic	33.00
Bessemer	36.30
Malleable	33.50
Gray forge	32.00
Standard low phosphorus	53.00
Copper low phosphorus	50.00
Northern charcoal	35.50
Southern charcoal	43.00
Silveries, 8 per cent	46.00
Bessemer ferrosilicon, 9 per cent	51.70

OLD MATERIAL

Delivered to Consumer

Heavy melting steel	$30.00
No. 1 railroad wrought	35.00
Cast borings	20.00
Machine shop turnings	20.00

SEMIFINISHED PRODUCTS

Pittsburgh and Youngstown

Rerolling billets	$47.50
Forging billets	60.00
Sheet bars	51.00
Slabs	50.00
No. 5 wire rods	57.00
Grooved skelp	2.90c
Universal skelp	3.15c
Sheared skelp	3.25c

FINISHED STEEL PRODUCTS

Per pound, base, Pittsburgh

Steel plates	3.25c
Structural shapes	3.00c
Steel bars	2.90c
Iron bars, mill	3.50c
Galvanized sheets, No. 28	6.25c
Blue annealed sheets, No. 10	4.25c
Black sheets, No. 28	5.00c
Plain wire, 100 pounds	$3.25
Wire nails, 100 pounds	3.50
Painted barb wire, 100 pounds	3.65

COKE

At Ovens

Standard furnace	$6.00
Standard foundry	7.00
Beehive crushed	7.30
By-product	base plus freight from nearest beehive oven to producer's plant.
By-product crushed, base	6.50

IRON ORE

Lower Lake Ports

Mesabi nonbessemer, 51½ per cent	$5.05

WAREHOUSE PRODUCTS

Mill base plus freight to warehouse plus $20 per ton on bars, structural shapes, plates, blue annealed sheets No. 16 and heavier, and billets.

Mill base plus freight to warehouse plus $25 per ton on one pass cold-rolled sheets, No. 18 and lighter, galvanized sheets and cold-rolled shafting.

C material to all other uses. The A and B classes are subdivided in the order of their importance as essentials of war. Licenses are issued by the priorities committee of the war industries board for the A and B requirements to signify their rank and to speed their fulfillment over other orders. No licenses are issued for Class C shipments. The effect of this differentiation of requirements is that after A and B needs have been satisfied the remainder goes to the filling of C business or that of a nonwar character. Priorities of transportation have further cleared the path for the swiftest possible execution of vital business. The use of iron and steel products for certain general classes of work was specifically forbidden by the order issued by the priorities committee under date of Oct. 27. In its main features the priority system has been borrowed from Great Britain, where a similar method of distribution has been in effect for many months.

Priority is Fundamental Idea

Examination of the full plan of federal regulation shows that control of priority represents the fundamental idea upon which the whole system is founded; and that the fixing of prices stands as a necessary complement to the latter. Observation of the results of the several months of application of the system to the iron and steel industry confirms this conclusion.

Today the iron and steel industry completely is yielding to federal authority. It must be emphasized, however, that this is a really voluntary and co-operative relationship on the part of the producer. No formal legal authority for the defining of maximum prices or of regulation of the industry has been conferred by act of congress upon the war industries board which, in fact, has no official standing except as express powers have been delegated to it by the President. The board occupies merely an advisory capacity toward the duly chosen officers of the government. Furthermore in the purview of the Sherman antitrust law which still is on the statute books, price agreements are nefarious instruments of trade. But then these are war times. That makes a great difference. The first law of strategy or rather common sense is to insure a supply of the most indispensable material of battle, which is iron and steel. The representatives of the government have set about methodically to see that this is done. The exception to the situation, as to express legal power over various materials of the iron and steel industry, is in coke. Under the Lever act or the food control bill, absolute legal authority for the production, sale and distribution of both coal and coke, is vested in the President through his appointee, the federal fuel administrator.

In the end all this talk of the legal aspect of the case merely is a matter of technical hair splitting. It cannot be honestly conceived that there are any limits to the broad constitutional power of the President of the United States in time of war as the commander-in-chief of all forces, military and otherwise, of the nation. Again, it is quite sure that were specific legal authority required to effect results, the enabling legislation would not be long in forthcoming and in a drastic form, probably. The priority powers of the President, under the food control bill, also give him or those to whom this authority is delegated by him, a very effective weapon for any contingency. It is nevertheless a creditable chapter in the history of the iron and steel industry that its leaders, acting in full and patriotic appreciation of their unusual responsibilities in this great crisis, unhesitatingly have subordinated private interest to national necessity, leaving the whys and wherefores of their legal rights as subjects for academic discussion.

The present war truly is one of iron and steel. The greatest national industry of its kind in the world, far exceeding in capacity that of Germany, is applying itself vigorously to the discharge of its supreme duty. It has brought itself to a war basis in surprisingly swift fashion. Whatever may be said regarding the state of progress of other war preparations of the government, it is certain that the real foundation upon which all must be buttressed, that of ample iron and steel supply, has been fully assured no matter what superlative proportions the ultimate requirements may attain.

Federal Control in First Stage

Extension of federal authority over every branch of the industry virtually still is in its early stages. Scarcely three months have elapsed since the publication of the President's original price statement. The subsequent steps have been gradual. In fact base prices, differentials and extras on a number of mill products are yet to be brought by official promulgation in line with those previously announced. However, government regulation has been in force a sufficient time to produce some very marked effects in the industry certain of which are likely to outlive the war crisis and may have important significance in the future.

On the purely technical side of prices there have been some interesting consequences. Before government regulation intervened, quotations of individual producers covered a wide spread. This was a natural outcome of the excessive demand. In plates for example, taking prices varied as much as $60 to $80 a ton. Similar conditions, in a degree existed in tubular goods, wire products, sheets and other lines. This situation grew out of the different policies which were being pursued by sellers. Some companies were inclined to put restraint upon their quotations; others allowed the law of supply and demand to take its free course. Fixed prices eliminated this general diversity and restored market uniformity.

Extras are Re-established

Similarly in the official recommendations of extras and differentials, various schedules which in the past had not been adhered to strictly or had been enforced in an irregular fashion in the tremendous market of the past two years, again were reestablished as fixtures. The effect of these announcements under government direction has been to standardize selling practice in a fashion that the industry has not shown for a long period if at all. This designation of proper extras and differentials on mill products, when finally rounded out, promises to endure long after the war. The reason for this is that producers under the sanctioned method of procedure have been able to consult together freely on price matters in a way which would not have been possible legally or for various causes they would not have cared to do in times of peace.

In pig iron, a final impetus has been given by the determination of official differentials based on chemical content, to the movement for the placing of orders and the valuation of grades strictly in accordance with analysis. While this method of buying legally has been followed in recent years, some traces of the old days of orders by fracture, still have obtained. Furthermore, in various districts there have been confusion and overlapping of grades and symbols. The pig iron industry now is possessed of a complete and correlated schedule of differentials, scientifically devised, which will go far toward modernizing and improving the conditions of buying and selling in this line. There is little doubt that the so-called government schedule of differentials largely will remain as a permanent institution in the

post-bellum period. To the extent that it has enabled the iron and steel industry to drop antiquated market practice and to substitute for it, new systems approved by concerted action government price fixing has done both producers and consumers a good turn.

It is safe to say that two-thirds of the production of the furnaces and mills of the country now are being devoted directly and indirectly to war uses. With some of the larger companies, this percentage of a military character is considerably greater. A recent official estimate showed that 80 per cent of the ingot output of the Steel corporation is going into war work. At times this percentage has been even larger with this and other producers. In some products the pressure of war demand has been much more intense than in others. Plates stand out as a conspicuous illustration of this fact, because of their relation to merchant shipbuilding and naval construction.

Blooming and billet mills due particularly to the great tonnage needed in semifinished form for the production of artillery ammunition, ordnance, etc., have been driven at top speed. The country's capacity for the production of large rounds has been extended to the limit. It was estimated in October when shell steel buying by the United States government was begun in earnest that a requirement of 2,500,000 to 3,000,000 tons then was in sight and this was to be filled as quickly as possible.

Indirect War Needs Heavy

Bar mill output also has been demanded in a considerable degree for munitions. The indirect war requirements imposed upon the mills which under the priority regulations are placed ahead of ordinary business and are second only to the direct needs of the battle line, have been voluminous and far reaching.

Through its priority machinery both of shipments and of transportation the government is enabled to obtain the swiftest delivery of these millions of tons of war business. By exercising this power, however, it not only has pushed back an equal tonnage of nonwar orders which long had been on mill books, but has placed various lines of manufacture of a so-called nonessential class in a position where tonnage is not likely to be obtained at all. The dislocation of normal productive activity which is resulting from this situation in reality has placed in jeopardy the immediate future of many manufacturing establishments and a widespread process of industrial adjustment now is going through the country in consonance with this condition. Various lines of manufacturing are being revamped or rearranged to partake of a character such as will serve in some way the general war machine. Only in this manner are these plants able at least for the present to assure themselves of governmental co-operation and the benefit of its superseding authority without which their supply of materials for manufacturing would become precariously uncertain at best. At the same time the general spirit of economy which pervades the country and the increased costs that are the normal accompaniment of war conditions, are cutting down the volume of new business in different branches of industry, not directly concerned with the supreme effort which the nation is making as a belligerent. This is effecting a natural redistribution of much-needed supplies such as iron and steel. The production of pleasure vehicles, including automobiles and their accessories, of building materials, except for construction pertaining to war requirements, of luxuries, novelties, etc., road building and innumerable other forms of normal enterprise are reflecting the influence of these conditions. Standardization of production in a given field also is resulting in a saving of effort which permits concentration in the most essential directions. Iron and steel makers both have felt the effects of this new industrial regime through the diversions of tonnage and on their own part have been helping to bring it about through directing distribution into those channels best serving the government. It has become almost necessary for a consumer to have a priority certificate to obtain shipments even against a contract long overdue. Consequently much old tonnage on mill books closed some months back and which is included in those classes barred from priority privileges, virtually has been rendered inactive and of nominal value to either buyer or seller.

Readjustment is Tremendous

The readjustment of industry is one of the most tremendous movements which the nation has undergone in years. It is very likely to leave its impress permanently on many forms of manufacturing enterprise. It is understood to be the policy of the government to effect this war transformation with as little lasting hardship to established industries as is possible. Obviously this can be the only sound policy for it is of paramount importance that the nation's fundamental commercial strength be not allowed to be sapped in the hurly-burly of war activities. The basic thought of the government underlying this reappraisal of the country's manufacturing facilities, is said to be the utilization of the capacity of every plant suitable for war production to the extent this is not actually needed for the maintenance of the national life. Probably a certain amount of pressure is thought to be necessary to bring about this metamorphosis. The arm for this purpose is the priority system.

While the country is passing through this recasting of normal business, the wrench is likely to be plainly felt. Indeed, already the ground-swells are appearing on every side. There is high authority for the opinion, such as Frank A. Vanderlip, that in the end industry will emerge stronger and better and that labor not only will be fully but more profitably employed than at the present time.

Tonnage Should be Ample

As to iron and steel, the war will continue to make heavy drafts upon capacity until enduring peace for the world finally is won. Even then the tremendous armament which the country will have acquired will demand much tonnage if only for maintenance. At present the industry is being drawn upon to supply the sinews for the creation of this great war machine. Requirements doubtless have not yet reached the peak. This growth however is not likely to be so accelerated or the monopoly of mill and furnace output be so extensive in the future as at the present time when the rush of initial preparations is under full steam. Great Britain with 8,000,000 tons of ingots at the beginning of the war and now with 12,000,000 tons, has built up a powerful war-making unit not unlike in scope and character our own. At the same time she has carried on her own national life and has supplied her allies with a large tonnage. This latter she has made up partially by imports from this country. In 1916 she exported 3,357,829 tons of iron and steel material and imported only 872,890 tons. It would seem to be a mathematical truth that the United States making 43,000,000 tons of ingots annually will be able to create the greatest war machine the world has ever seen, take care of all deficiencies of her allies to the same extent as in the past few years and still have 20,000,000 tons or more for home consumption. The prospect for the average business being able to obtain its proper proportion of this tonnage is reasonably assured whenever the operation of the normal laws of distribution is allowed to take its natural course

Unparalleled Events Fill Busy Year

Government Regulation Terminates Most Spectacular Market Performances and Highest Price Levels in History of Iron and Steel Industry—Production Surmounts Obstacles of Speeded-Up Conditions—Future Developments Now in Doubt

MORE market history was made in 1917 than in any other like period since iron and steel became the premier industry of the country. In truth an adequate comparison with the past falls short because no previous period offers even a limited parallel to the extraordinary twelve months just ended. International political factors of an extraordinary character were joined with unusual economic conditions to produce easily the most remarkable year in the annals of the industry. For the first time ever known, federal authority was exercised over the movements of prices and of distribution. This developed from the fact that the war had made the United States government the principal patron of the blast furnaces and the mills. In fact, the broader questions of national interest and war power are superseding at present all normal considerations of a commercial character. This condition has prevailed for a number of months.

Year Falls Into Two Great Periods

The year logically falls into two distinct periods. The first was of practically seven months' duration. In that period under an overwhelming demand from an impoverished world, prices were carried so far beyond anything in the previous experience of the industry, as at present constituted, that they probably set the high water mark for this and future generations. The second period dates from the time at which full government regulation was put in force and the few weeks preceding during which the trend of events toward federal control clearly was foreshadowed. The first period recorded a true expression of the fundamental relation of supply and demand in a virtually world's market. The second represented an abnormal situation where commercial factors were subordinated to national expediency and artificial market conditions were enforced.

The line of prices in the year when left to the unrestricted forces of supply and demand ran upward in phenomenal fashion until the apex of this movement was reached in July and August. This rise was the natural extension of the tremendous volume of buying in 1916 which had expanded order books to the point of saturation. Upon this peak of tonnage there still were piled during the early months of the year further orders in liberal volume. The seemingly insatiable demand for iron and steel products from all quarters of the globe kept manufacturers under a perfect deluge of inquiries. The situation gradually reached the point with the mills where capacities were so far engaged that bookings automatically checked themselves. It then became the exception when new business could be accepted.

At first the war requirements of the government did not cause any extensive dislocation of new buying. Business went on largely in the accustomed channels, general demand continued as excessive as ever and prices mounted steadily. Then the scope of the government's war program gradually began to unfold itself. A shipbuilding effort of unrivaled magnitude was launched. New naval construction was laid out on a large scale. Supplies of ordnance and munitions were provided for, based upon the expectation of a prolonged and vigorous struggle. Every turn of the nation's new war machine brought a fresh demand for tonnage upon the overcrowded mills and furnaces. These war needs, direct and indirect, have grown steadily until they have reached a tremendous figure. In September it was estimated on high authority that government requirements of 7,000,000 tons for nearby shipment were before the industry. This crush of critical necessities now has reached the point where it is displacing rapidly all other business. It has become practically out of the question for manufacturers to fill requirements not connected with the war.

Export Demand Is Major Factor

AS IN 1916, one of the truly dominant factors in bringing about and in sustaining the year's market on its unusual plane of price and tonnage was the export demand. The movement overseas purely became a question of carrying facilities, and this as well as mill capacity fixed the tonnage that could be sold. At all times the demand was far beyond the facilities either to transport or to produce. In total, the exports of 1917 practically equaled those of 1916. For the first 10 months they aggregated 5,190,717 gross tons. In the calendar year of 1916, the total was 6,110,732. On Aug. 15 the government established an embargo on the exportation of certain classes of steel except by license. This embargo had the effect of giving the government a flexible control over domestic iron and steel supplies not only to better assure its own needs, but to make certain that the distribution of the foreign tonnage would go into the most desirable channels.

Pig iron accomplished the seemingly impossible in the year and basic, bessemer and foundry grades were sold freely at above $50, furnace. What they would have brought had the government bar not been on prices during the latter part of the year when coke shortages produced a veritable famine of metal is an open question. Belief has been expressed by close students of the market that $75 to $100 would not

have been beyond reason under the economic situation that then obtained. Bessemer in July sold at the top figure of $57, valley, and the average for that month was $57.95, Pittsburgh. This represented an advance of $22 over the average for December, 1916. Basic rose from $30, valley, in December of the previous year to $52.25 in July. Foundry iron got up to $55, valley, in July, but failed to reach the figure it commanded in 1864, which was over $73, furnace. Nor did it equal its performance of the same year when prices in the Lehigh valley between May and December ranged from $59.50 to $70.25 per ton. The high price for eastern Pennsylvania No. 2X in 1917 was $52.50, furnace. Low phosphorus iron experienced a most spectacular flight. In the first half of the year it advanced from $53.50 to $92.50, Philadelphia. These astounding values for pig iron symbolize the unexampled demand that existed for every form of blast furnace product. One of the effects of these very profitable prices for the maker was the reclaiming to production of many isolated and high-cost furnaces which long had been carried on the country's inactive list and were regarded as unlikely to resume.

Finished Steel Products Bid Up Excitedly

FINISHED steel products moved upward with swift strides from January to August, or during the period when the market was unrestrained. The advances in mill material were very erratic, however, as the pressure of buying was unequally applied. Plates stand forth as the most violent performer of the year owing to the frantic efforts that were made by every maritime nation of the globe to obtain shipbuilding material in order that they might profit from the very lucrative conditions prevailing in the ocean transportation market. Eastern Pennsylvania mills as usual were leaders in quoting up the market to its record point. Tank plates got up to 10c, Pittsburgh, in July, and Lloyds' ship steel then ranged from 11c to 12.50c, Pittsburgh. Marine boiler steel, United States standards, was marketed at the unprecedented figure of 20c, Pittsburgh. The maximum advance in tank plates in the year was from 4.75c, Pittsburgh, in December, 1916, to 10c, Pittsburgh, in July, or $105 per net ton. Most of the high prices in plates were paid for export tonnage. Structural shapes scored an advance of $60 a ton, or from 3c to 6c, Pittsburgh; steel bars, $30 a ton, or from 3c to 4.50c, Pittsburgh; blue annealed sheets, $90 a ton, or from 4c to 8.50c, Pittsburgh; blast sheets, $90 a ton, or from 4.50c to 9c, Pittsburgh; galvanized sheets, $80 a ton, or from 6.50c to 10.50c, Pittsburgh; wire nails, $25 a ton, or from $3 to $4.25, Pittsburgh, per 100 pounds; and tin plate, from $6 to $8 a ton, some export sales having been made at $15, Pittsburgh, per base box. Sheet bars were sold at $105, Pittsburgh, or an advance of $45 in the half year; and billets at $100, Pittsburgh, a rise of $40. Heavy melting steel scrap at Pittsburgh went from $25 per gross ton in January to $40.25 in July; and No. 1 cast, from $20 to $34.75, in the same period. Spot Connellsville furnace coke was bid up to $15, ovens, and Connellsville foundry coke on contract was sold at $12.50, ovens. As in pig iron, the extraordinary prices which mill steel attracted brought about the rehabilitation of numerous old plants which had been discarded in the former days of close operating margins.

Production Overcomes Obstacles

AS the accompaniment of an industrial situation kept constantly in high gear, iron and steel production in the year has been attained in the face of a series of unusually severe and numerous obstacles. Labor has been inadequate and less stable; and raw material shortages principally in coal and coke have exercised a drag upon capacity the effect of which at times was marked. Underlying this factor of manufacturing supplies has been the fundamental deficiency of traffic facilities. Handicapped by an abnormally delayed opening of navigation which imposed a loss of 3,500,000 tons at the start, the season's iron ore movement from the Superior ranges reached the very creditable total of approximately 64,500,000 gross tons of which 62,498,901 tons were moved by vessel. This compares with a late movement of 64,734,138 tons and total shipments of 66,658,466 gross tons in 1916, the record year. Pig iron production in 1917, including charcoal, was about 38,800,000 gross tons as against 39,434,797 tons the preceding year. The steel works turned out, it is estimated, 42,600,000 gross tons of ingots. The yield of the preceding year was 41,401,917 gross tons. Finished steel production probably will be 32,000,000 tons. Coke clearly reflected the erratic traffic conditions of the year. Shipments of the Connellsville region in the twelve months were not over 17,500,000 tons. In 1916 they were 21,654,524 tons.

At the beginning of 1918 radically different conditions hold sway in the iron and steel market compared with twelve months previously. One year ago buying and selling were free to pursue their own movements and prices fluctuated in the degree that material was bid for. The world was the market field. Now federal authority is all-extensive. Purchases more and more are being restricted to defined and limited purposes. Largely they are being confined to the war necessities of the government and its allies. As events have proved, virtually there was no limit to the point where prices, starting a year ago, could rise; today the maximum levels that the producer may quote are fixed. Moreover, there is no assurance they will not be further reduced arbitrarily by subsequent action. War made the great market and the tremendous prosperity of the American iron and steel industry of the past two years. War now has produced a unique and counter condition of which the significance and final results to the industry are yet to be shown. How the various aspects of this new order of affairs may develop during the next year are questions for speculation and doubt since precedent fails to offer the slightest guidance.

History is Freely Made in Pig Iron

Fifty Dollar Metal a Figure of Fancy Becomes Common Price of Market—Government Regulation Checks Upward Movement Which Probably Would Have Broken All Records—Demands Exceed Capacity of Furnaces

A DREAM came true in 1917. A vision has become history. Fifty-dollar steelmaking pig iron, regarded by optimistic producers as a remote possibility during the spectacular upward movement of the market the early part of April, became a reality about June 1. Seventy-five dollar and even $100 iron likely would have been attained the latter part of the year, had it not been for the voluntary reduction of quotations, subsequently approved by President Wilson. The successful application of the so-called war price on all grades of pig metal consumed both for war and domestic purposes was equally as notable an achievement as the establishment of quotations at historically high levels. All grades did not attain the $50 level, although the entire market went to maximums that had not been approached before in the history of the industry except foundry iron which in August, 1864, sold at an average price of $73.63. But a number of grades went well past $50, and one, low phosphorus iron, almost doubled it when it hit the high mark of $92.50, Philadelphia, in the third week of June, an advance from $53.50 from the first week of the year. Most grades registered their greatest levels in July.

Consumers during the closing month of the year scoured the country for iron, many of them in vain. The shortage which now obtains is pronounced in nearly all grades, especially basic foundry and malleable. Steel works which are operating heavily on war orders, are greatly concerned as to where they will obtain iron, while furnaces are straining themselves to meet obligations. Irregularity of coal and coke supplies and bad traffic conditions are responsible in large measure for the inadequacy of pig iron production. The total output for the first 11 months of 1917 was 35,367,853 tons, as compared with 35,834,945 tons for the corresponding period in 1916. Exports of pig iron for the 10 months ending with October totaled 562,969 tons, compared with 395,260 tons for the same period in 1916. During the early part of December 344 of the 434 blast furnaces of the country were in operation, comparing with 322 out of a total of 420 which were blowing at the corresponding time in 1916. Demand for iron was active practically the entire year. At the close of 1917 it was little short of frenzied. A leading authority estimated about the middle of November that the shortage at that time was at the rate of about 3,000,000 tons per annum.

Representatives of the iron and steel industries, including iron ore and coke, were called by the war industries board to meet with it at Washington on Sept. 24, 1917. The meeting was presided over by Judge Lovett, acting chairman of the war industries board, and the industries elected Judge E. H. Gary, president of the American Iron and Steel institute, as their spokesman. The war industries board explained what President Wilson had in mind for the best interests of the government and its allies, with respect to the prices of steel necessary for war uses and of all the materials used in the manufacture of steel. It stated the President had come to the conclusion that the situation could be clarified only and justice done to all the interests involved by establishing the same prices to the public as might be agreed upon as applicable to the needs of the government and its allies. The industrial representatives had entered the meeting with varying notions about the propriety of any prices agreed upon being made universal in their application, but it may be stated that all of them had come to the meeting reconciled to the idea that such of their products as were required by the United States government and its allies must be tendered

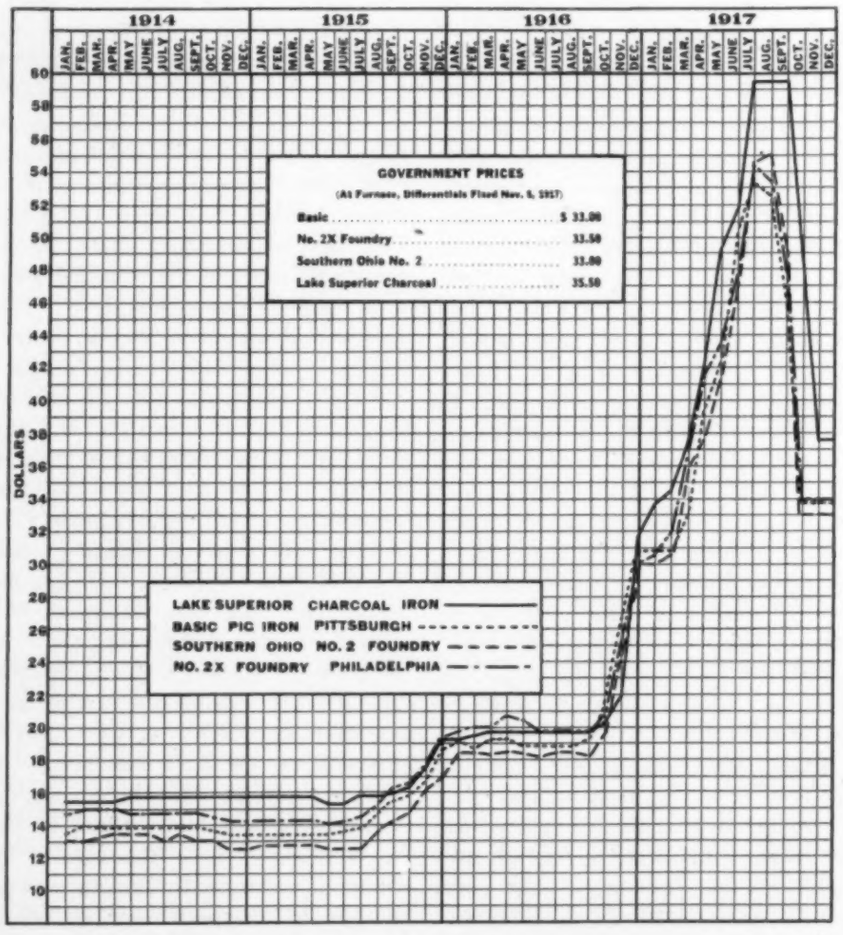

1914
1915
1916
1917
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
DOLLARS
60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10
GOVERNMENT PRICES
(At Furnace, Differentials Fixed Nov. 5, 1917)
Basic ..... $ 33.00
No. 2X Foundry 33.50
Southern Ohio No. 2 ..... 33.00
Lake Superior Charcoal 35.50
LAKE SUPERIOR CHARCOAL IRON
BASIC PIG IRON PITTSBURGH
SOUTHERN OHIO NO. 2 FOUNDRY
NO. 2X FOUNDRY PHILADELPHIA

CHART OF PRICES ON FOUR LEADING GRADES 1914-1917

at prices which would be satisfactory to the representatives of the government. After hearing the expressions of the President's thoughts on the subject, the matter was left with the industrial representatives and the board retired from the meeting. It was agreed upon, however, that the entire subject was too complicated to permit of treatment by such a large body as was present, and that, therefore, the work of the conference would be confined to base products only; that is, iron ore, coke, pig iron, plates, shapes and bars.

Following many hours of discussion and calculation, a scale of prices was submitted to the war industries board. Upon a further conference with that body, a few modifications were made and the work of the conference was submitted to the President, who approved of it, and upon his public announcement of his approval, the iron and steel interests in the United States, with very few exceptions, if any, adopted the prices as law, and they have been since observed as such. It was agreed upon later that the differential prices on the great variety of shapes and forms of steel proceeding from the bases treated of would be committed to the committees of the American Iron and Steel institute for consideration and recommendation to the war industries board. The matter of differentials on the many varieties of pig iron was submitted to the subcommittee on pig iron, iron ore and lake transportation, composed of the following: Chairman, H. G. Dalton, Pickands, Mather & Co., Cleveland, C. D. Dyer, the Shenango Furnace Co., Pittsburgh; Leonard Peckitt, the Empire Steel & Iron Co., Catasauqua, Pa.; W. T. Shepard, Rogers, Brown & Co., Buffalo; A. H. Woodward, Woodward Iron Co., Birmingham, Ala.; Frank Billings, Tod-Stambaugh, Cleveland; H. Coulby, Pittsburgh Steamship Co., Cleveland; Frank B. Richards, M. A. Hanna & Co., Cleveland. Immediate action was taken.

The committee called together in New York representatives of the blast furnace interests in all sections in the United States and Mr. Dalton was chosen as chairman of the conference. The conclusions were submitted through the committee on steel and steel products to the war industries board and were promptly approved. The foundation of the work of the conference was the base price of $33 for basic and No. 2 foundry iron, which was adopted as the authorized price for these grades of iron at all

Prices of Representative Grades of Pig Iron, 1914-1917

BASIC, PITTSBURGH

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	$30.95	$30.95	$32.85	$39.20	$42.15	$50.20	$53.20	$52.75	$43.95	$33.95	$33.95	$33.95
1916	19.20	18.77	19.20	19.20	18.95	18.95	18.95	18.95	19.08	20.83	25.95	30.95
1915	13.45	13.45	13.45	13.45	13.45	13.54	13.83	14.89	15.65	15.95	16.70	18.55
1914	13.42	14.09	13.96	13.90	13.90	13.90	13.90	13.90	13.90	13.75	13.45	13.45

BESSEMER, PITTSBURGH

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	$35.95	$35.95	$37.45	$42.20	$44.95	$55.20	$57.95	$55.55	$48.27	$37.25	$37.25	$37.25
1916	21.32	21.45	21.55	21.95	21.95	21.95	21.95	21.95	22.20	24.33	30.35	35.95
1915	14.70	14.63	14.55	14.55	14.55	14.58	14.88	15.89	16.80	16.95	17.45	19.70
1914	15.00	15.09	15.15	14.90	14.90	14.90	14.90	14.90	14.90	14.85	14.70	14.70

NO. 2X FOUNDRY, PHILADELPHIA

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	$30.50	$31.75	$36.90	$41.75	$43.35	$47.50	$54.35	$53.40	$47.80	$34.00	$34.00	$34.00
1916	19.75	20.00	20.00	20.75	20.50	19.75	19.75	19.75	19.75	20.50	25.25	30.00
1915	14.25	14.25	14.25	14.25	14.00	14.25	14.50	15.25	16.25	16.50	17.50	19.25
1914	14.75	15.00	15.00	15.00	14.75	14.75	14.75	14.75	14.75	14.50	14.25	14.25

SOUTHERN OHIO NO. 2 FOUNDRY, IRONTON

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	$30.00	$30.75	$35.80	$37.75	$41.20	$47.50	$54.50	$55.00	$49.25	$33.00	$33.00	$33.00
1916	18.30	18.50	18.30	18.50	18.50	18.15	18.44	18.40	18.13	19.38	24.00	30.00
1915	12.75	12.75	12.75	12.75	12.56	12.50	12.60	13.63	14.20	14.88	16.13	17.00
1914	13.00	13.00	13.25	13.50	13.50	13.50	13.00	13.50	13.00	13.00	12.63	12.63

LAKE SUPERIOR CHARCOAL IRON, CHICAGO

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	$33.75	$34.50	$37.55	$42.25	$49.25	$51.80	$59.50	$59.50	$59.50	$48.50	$37.50	$37.50
1916	19.25	19.50	19.75	19.75	19.75	19.75	19.75	19.75	19.75	20.35	21.95	31.75
1915	15.75	15.75	15.75	15.75	15.25	15.25	15.75	15.75	15.95	16.25	17.50	19.25
1914	15.50	15.50	15.50	15.50	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75

STANDARD LOW PHOSPHORUS, PHILADELPHIA

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	$54.50	$57.50	$66.70	$75.50	$77.00	$85.00	$92.50	$92.50	$82.00	$55.50	$55.50	$55.50
1916	54.50	57.50	66.70	75.50	34.00	34.00	33.00	33.00	34.00	40.00	46.00	55.00
1915	19.00	19.00	20.00	20.00	20.00	20.50	21.50	23.50	24.50	28.00	30.00	32.00
1914	21.00	21.00	21.00	21.00	21.00	20.50	20.50	21.00	21.00	21.00	19.00	19.00

BASIC EASTERN PENNSYLVANIA

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	$30.15	$30.50	$33.80	$38.25	$40.80	$46.40	$50.75	$51.00	$46.50	$33.50	$33.50	$33.50
1916	19.50	19.50	20.00	20.50	20.00	19.25	19.00	19.25	20.00	21.00	25.50	30.50
1915	13.50	13.75	14.00	13.25	13.50	13.50	13.75	15.25	17.25	17.50	17.75	18.00
1914	14.00	14.25	14.25	14.25	14.00	14.00	14.00	14.00	14.00	14.00	13.50	13.50

VIRGINIA NO. 2X FURNACE

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	$26.50	$28.25	$34.25	$38.40	$41.00	$46.50	$52.25	$51.90	$46.50	$33.50	$33.50	$33.50
1916	17.25	18.00	18.25	18.50	18.50	18.50	18.50	18.50	17.50	18.50	23.75	27.00
1915	12.50	12.50	12.50	12.50	12.50	12.50	12.50	13.00	13.50	14.00	15.50	17.00
1914	12.75	12.75	12.75	12.75	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50

SOUTHERN NO. 2, BIRMINGHAM

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	$23.00	$24.50	$28.00	$35.80	$35.75	$35.75	$46.00	$48.00	$43.50	$33.50	$33.50	$33.50
1916	14.50	14.65	15.00	15.00	15.00	14.45	14.00	13.60	14.40	15.15	19.60	23.00
1915	9.50	9.50	9.40	9.35	9.75	9.55	9.60	11.00	11.30	11.75	13.15	14.20
1914	10.50	10.50	10.60	10.50	10.50	10.45	10.05	10.00	10.00	10.00	9.90	9.50

blast furnace points. In arriving at prices differing from the base which would be fair to the manufacturers of low phosphorus, charcoal, bessemer, malleable, the higher silicon grades and the various grades of foundry iron, a study was made of the practices of the trade in the different localities and comparisons were made as to the estimation the public had placed upon the values of the different grades, not only during normal times but since the war conditions had obtained. These differentials were approved by the committee on steel products of the American Iron and Steel institute and were announced Nov. 5.

At the opening of the year, furnaces in the central west and the south had ample stocks on hand and while there was no shortage in the valleys, western Pennsylvania and the east, stocks were rather low. The increasing demand made itself felt from the outset. Foreign requirements at that time were extremely heavy. The scarcity of vessels and the prohibitive freight rates, however, prevented the major portion of these demands from being placed. On shipments to Italy, $50 to $60 was asked in January, while the rates to France ranged from $55 to $60. Early in January, the French government put out an inquiry for 100,000 tons of bessemer, and closed for 20,000 tons at $35, valley, or $37.14, New York. Japan bought large quantities of iron, principally foundry and basic. The Scandinavian countries and Italy also purchased heavy tonnages. Furnaces in the east and the valleys took especially large foreign tonnages. Early in February Italy placed 75,000 tons of bessemer with valley furnaces and apparently had a standing order for 100,000 tons of this grade.

As the result of the tremendous commitments of furnaces, both from domestic and foreign sources, deliveries were falling behind in some districts, such as in the east and western Pennsylvania and eastern Ohio, and many consumers were on the verge of having to shut down. Steel companies in all sections bought heavily. The Jones & Laughlin Steel Co., Pittsburgh, was a conspicuous buyer during the entire year. Toward the close of the year various subsidiaries of the United States Steel Corp. came into the market for both basic and bessemer iron for the first time in many years. The American Bridge Co. bought 7500 tons of basic in one lot for its Pencoyd, Pa., plant. The National Tube Co. and the American Steel & Wire Co. also took tonnages, buying over wide territory. The greatest buying movements in the Pittsburgh district took place in March, June and October.

The close of the year found valley furnaces practically committed entirely for the first quarter and first half. Some producers limited their commitments for these positions to 65 to 75 per cent of their theoretical output, thus protecting themselves against any contingencies that might arise, such as the shortage of raw materials. Long and hard drives showed their effect and forced numerous valley furnaces to blow out for repairs.

Inquiry for pig iron in the Chicago district was extremely heavy at the close of the year and extended into the third quarter and last half of 1918. Some sales were made for third quarter, but no business was closed for the entire last half, although sellers were willing to book tonnage for that delivery at the present fixed rate. Melters were working hand to mouth and delay in delivery in some cases caused some foundries to shut down until iron was received. Lake Superior charcoal makers are sold fairly full for first half and have been taking interest in last half tonnage, some of which has been placed. Much off-iron was produced in the Chicago district, as in other centers, as a result of poor coke.

Eastern Makers Are Buyers

In the eastern pig iron market practically all steel companies which ordinarily produce enough iron to meet their own requirements were forced to come into the market for large tonnages. The Lukens Steel Co., as usual, was the largest single buyer of basic in the east during 1917. In March and April this interest closed for 60,500 tons from eastern furnaces, at $34 to $35, delivered, for second half. In May it placed an additional 45,000 tons at $42, delivered. Of the latter, about 25,000 to 30,000 tons were for 1918. In January standard low phosphorus was so scarce in the east that one consumer there had to go to Milwaukee to obtain spot iron. At about the same time a sale of eastern spot was made at $57, Philadelphia. At that time copper-bearing low phosphorus was selling at $55, eastern Pennsylvania. At the end of January 1000 tons of eastern bessemer were sold to Canada at $36, furnace. Fair tonnages of Buffalo malleable were selling in the east at that time at $35, Buffalo, and about the middle of February the Central Iron & Steel Co. sold 25,000 tons of 0.70 per cent phosphorus basic to Italian buyers at higher than $32.50, tidewater. At this period also the Bethlehem Steel Co. bought 5000 to 10,000 tons of standard low phosphorus for future shipment at $57.62, delivered. Late in March, and early in April, sizable sales began to be made for delivery in the first half of 1918. About the middle of April the Bethlehem Steel Co. purchased about 11,700 tons of bessemer at close to $40, eastern furnace. In May numerous sales of southern iron were made to Japan at $41.50 to $42, Birmingham. Bessemer was selling to Japan at as high as $44, New York. Early in May the Baldwin Locomotive Works bought approximately 8000 tons of foundry for last half at prices equivalent to $42.50 to $43.50, Philadelphia. Sales were made then also of Buffalo iron at $45 for 1917 and $40 for 1918, while the eastern Pennsylvania minimum was $42, furnace. The Bethlehem Steel Co. in May bought 10,000 tons of standard low phosphorus. By the end of May southern iron and Buffalo iron were beginning to be bought with difficulty beyond 1917. In June the Baldwin Locomotive Works closed for 14,000 tons of foundry at prices ranging from $42, furnace. The asking price under $50, eastern furnace, for No. 2X immediately disappeared and by June 25 eastern Pennsylvania makers asked from $50 to $54, furnace, for No. 2X, the lower prices in most cases being quoted only for immediate acceptance. Toward the end of June a large tonnage was sold to an eastern maker at $60, furnace. During the middle of July sales of Lebanon low phosphorus were made at $33.

The export embargo declared by President Wilson became effective Aug. 15 and one result of it was the offering at resale of a great deal of iron which had been sold for export. These resale offers and the greatly reduced demand led to a well defined reaction, declines of $2 to $3 a ton taking place on several grades.

At the opening of 1917, southern iron was selling at an average of $24.27 per ton, that is, all grades considered. Prices rose and prior to Sept. 24 a special analysis iron had sold as high as $57, Birmingham, while $48 and $50 for foundry No. 2 and basic were common prices. As the prices of iron went up and the demand became more urgent, there came a spread of rehabilitation of furnaces throughout the south, Georgia, Tennessee and Alabama participating in this movement. New companies were organized and old properties taken over, improved and placed in operation. The makers of iron took on the same ideas of progression as did the prices.

Car Supply Dominates Coke Market

Traffic Conditions Supplemented by Labor Shortages Cut 1917 Production by Large Margin and Precipitate Famine in Supplies Which is Reflected by Remarkable Rise in Prices, Both Spot and Contract

WITH a runaway market prevailing for some time before levels were fixed on Sept. 24 by the fuel administration, blast furnace and foundry coke commanded enormous and unprecedented prices in 1917. Production in the Connellsville region up to the week ending Dec. 8 totaled 17,019,222 tons according to the Connellsville *Courier* and for the year approximated 17,619,000 tons. This compares with 21,761,605 tons produced in 1916, the record year. The decrease for 1917 was, therefore, about 4,142,604 tons. The new year comes in with an extreme scarcity of fuel at blast furnaces and banking has been frequent as a result. Coke production for the year exceeded the car supply. So the outstanding feature of the market was a shortage of cars, a condition that was and is extremely serious. Because of the lack of a regular supply of rolling stock considerable tonnage of coke was drawn from the ovens and dumped on the ground awaiting shipment. It was not uncommon in the year for the car supply to dwindle down to 30 per cent of allotments. During the last quarter the average was a little more than 50 per cent. Operations of the Connellsville regions sufficient to meet all demands of furnaces would have required about 70 per cent.

Situation Causing Anxiety

The new year comes in with the coke situation one of much anxiety despite the numerous steps taken to solve the attendant problems. The remedial efforts made include priority orders, proposed use of any kind of equipment in which fuel could be shipped and attempts to eliminate cross shipping in the Connellsville region. While the bad traffic situation was easily the greatest hindrance to the coke industry in 1917, labor conditions were extremely unsatisfactory on the whole.

While production in 1917 in the Connellsville regions fell below that of the preceding year, relief is promised by the building of additional by-product plants. The greatest undertaking of this kind is that of the Carnegie Steel Co., which is putting in a battery of 1280 by-product ovens at its Clairton, Pa., works. When all of these ovens are in operation they will insure capacity blast furnace output of the company. The ovens will serve nearby furnaces as well as some on the Ohio river. Coal will be brought to the ovens by water, thus making more cars available in the Connellsville regions. It is hoped to have 640 of the ovens in operation in March. The output of this number of ovens, one-half of the total to be built, will be approximately 2,000,000 tons annually. In 1917, more than 500 retort ovens were put into operation by owners of merchant and steel works blast furnaces, who in the past had depended either wholly or in part upon the Connellsville district for fuel.

The remarkable advances in prices of coke is shown by a glance at the monthly averages for a series of years. In 1913 Connellsville furnace

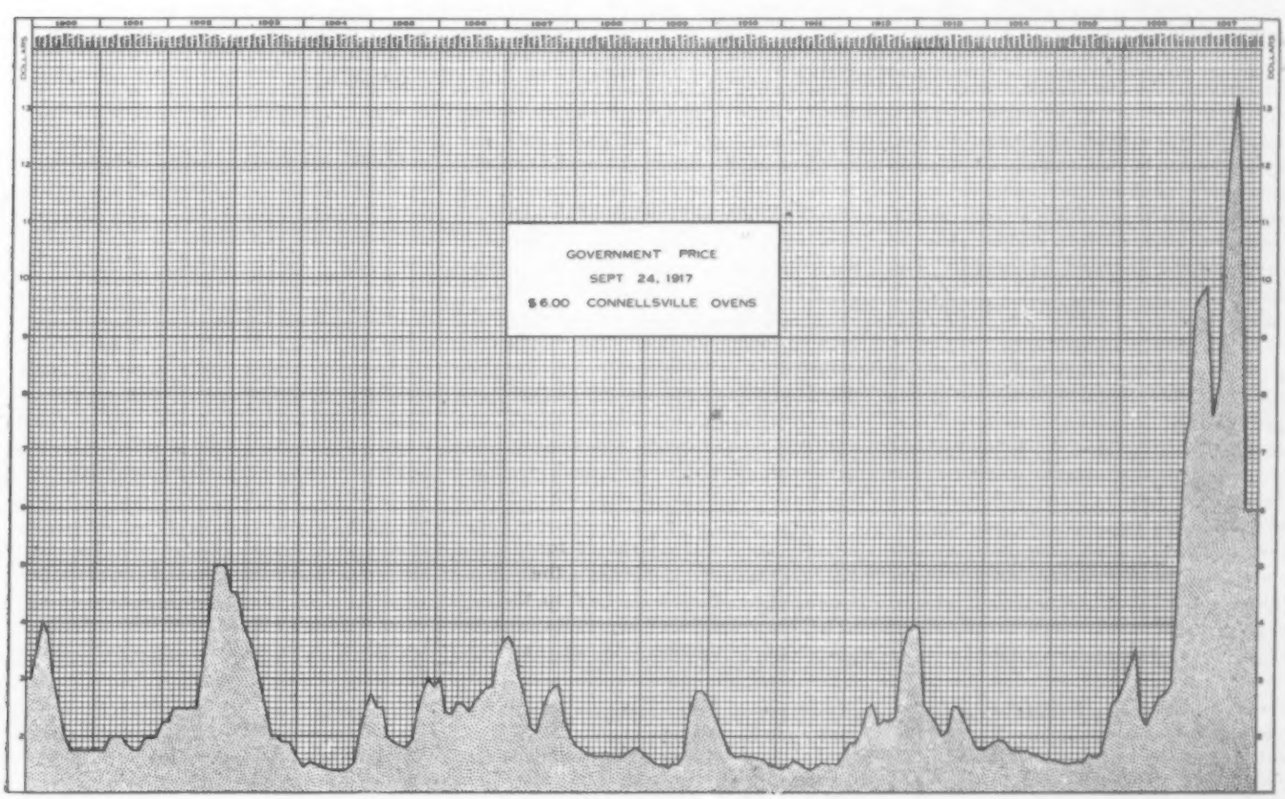


CHART OF AVERAGE MONTHLY PRICES AT OVENS OF CONNELLSVILLE FURNACE COKE 1900-1917

coke for prompt delivery averaged $2.34; in 1914, $1.75; in 1915, $1.78; in 1916, $4.25, and in 1917, $8.90. Connellsville foundry coke for spot shipment in 1913 averaged $3.06; in 1914, $2.29; in 1915, $2.24; in 1916, $4.42, and in 1917, $10.51. Even these comparisons do not adequately emphasize the price situation in 1917 for the averages are brought down sharply by reason of the fact that the government prices, fixed greatly below those that prevailed in the open market, are necessarily taken into calculation. The wide ranges of prices can be appreciated by pointing out that spot furnace coke reached its lowest level the first week of May, when it was selling at $7 and its highest point during the week of July 5, when it commanded $15.50. Contract furnace coke was at its lowest level the first week in January, when it sold at $5, ovens. The highest price it commanded, $10, ovens, was during the week of July 12. Spot foundry coke reached its lowest point during the week of April 12, when it sold at $9.50, ovens, and its highest price, $15, ovens, during the week of July 12. Contract foundry coke sold at $6 at the opening of the year, which was its lowest price, and it reached its maximum level of $12.50 during the week of July 12, although it is understood that some tonnages for this delivery were closed in the greater Pittsburgh district at as high as $15. While there were fluctuations in prices, the general tendency was decidedly upward. Blast furnace interests as a matter of fact shortly after the first half of the year gave only secondary consideration to prices. Their great trouble was in obtaining supplies, although the movement was fairly free at this time.

On Oct. 25 the fuel administration fixed a price of $6, ovens, on furnace coke. There was an extreme reluctance on the part of most operators to sell at this figure and a general refusal to accept spot business. It was a common thing for the great portion of the operators to evade taking this business, by claiming they were engaged in filling contracts, which, of course, had been made at much more attractive prices than that fixed by the government. This was rather remarkable in view of the fact that only a short time previously it had been the practice to defer shipments on contracts in order to accept spot tonnages which in turn were sold at higher prices than those provided in contracts. In other words the operators who indulged in this practice had reversed their positions. There is still a marked hesitancy to close business at government prices and reports have been persistent that the food control act, regulating these prices, has been repeatedly violated through sales at levels above those established. This, of course, does not apply to all operators for a number of them, including the larger ones, have adhered strictly to the law. Blast furnace interests from time to time have complained to the fuel administration that coke operators were trying to obtain higher prices than those set.

On Nov. 5, the fuel administration reaffirmed the blast furnace coke price of $6 and established prices of $7 on 72-hour foundry coke, and of $7.30 on crushed coke over 1-inch size. These prices applied f.o.b. ovens, in car lots, net ton, and were effective on all coke made in ovens without by-product recovery east of the Mississippi river. The extra $1 on foundry coke and the extra $1.30 on crushed coke were fixed to clear up certain points and to enable producers to do business, it was announced by Director Blauvelt. On the following week, prices for by-product coke, except that produced in New England, were established as follows: Run of oven, $6; select foundry, $7; crushed 1-inch size, $6.50; these are base prices and to each is added the freight rate from the beehive district, which takes the lowest freight rate to the point where the by-product coke is produced. The sum of these two figures makes the quotations on the by-product coke f.o.b. cars at the by-product ovens to the consumer base, switching or freight charges to recover its transportation to his plant.

As a rule, coke prices in the east in 1917 were in conformity with those prevailing in the Pittsburgh district, excepting when car shortage on one road, as compared with others, resulted in a disparity. The highest price reached on eastern business was $16, at which large tonnages of furnace fuel were sold on the approach of the July 4 holiday. The continued difficulty in getting coke led to the placing of contracts for tonnages over long periods. In the early part of June a large melter closed for his foundry requirements up to July 1, 1919. This buisness went at $10, Connellsville ovens, for the last half of 1917; $9.75 for the first half of 1918; $9.50 for the last half of 1918, and $9.25 for the first half of 1919. Few contracts covering the entire year 1917 were made in the Pittsburgh and valley districts. In the latter districts, however, contracts on a sliding scale for the first half of 1918 were made. As a general thing these were on a ratio of five and five and one-half to one,

1917 Coke Prices

MONTHLY MINIMUM PRICES PER NET TON CONNELLSVILLE OVENS

Months	Furnace Prompt	Furnace Contract	Foundry Prompt	Foundry Contract
Jan.	$9.56	$7.25	$10.38	$6.38
Feb.	9.75	8.00	10.88	6.50
Mar.	9.90	7.60	11.30	6.90
Apr.	7.62	7.25	9.62	7.88
May	8.20	8.00	9.65	8.50
June	11.12	8.50	11.188	10.88
July	12.50	9.62	13.00	12.38
Aug.	13.20	10.00	12.70	12.50
Sep.	11.12	9.62	13.3125	12.50
Oct.	6.00	6.00	7.00	7.00
Nov.	6.00	6.00	6.60	6.60
Dec.	6.00	6.00	7.00	7.00
Av. for yr.	9.24	7.82	10.51	8.90

Virginia, West Virginia and Alabama Coke Prices

MONTHLY CONTRACT PRICES FOR THE YEAR 1917

	Wise County		Pocahontas		New River		Alabama	
	Furnace	Foundry	Furnace	Foundry	Furnace	Foundry	Furnace	Foundry
January	$5.39	$6.82	$5.36	$6.59	$5.44	$6.84	$6.35	$7.00
February	8.40	8.98	8.26	9.29	8.94	10.00	5.70	8.14
March	8.00	9.25	8.00	9.25	8.30	11.94	6.03	10.77
April	7.46	8.36	7.46	8.36	7.56	8.69	6.58	11.50
May	8.25	8.75	8.25	8.25	8.75	9.75	7.00	11.50
June	8.86	10.08	9.25	9.44	8.75	10.50	7.00	11.50
July	9.95	11.10	9.56	10.32	8.75	10.75	7.00	11.50
August	10.47	13.00	10.60	12.80	9.25	12.70	7.00	11.50
September	9.60	11.25	9.60	11.18	9.25	13.70	6.80	10.60
October	6.00	7.00	6.00	7.00	6.00	7.00	6.00	7.00
November	6.00	7.00	6.00	7.00	6.00	7.00	6.00	7.00
December	6.00	7.00	6.00	7.00	6.00	7.00	6.00	7.00

based on the price of basic iron, valley. The price of basic iron having been fixed at $33, furnace, contracts based on the former ratio call for delivery at $6.60 and on the latter ratio at $6.

Demand for both furnace and foundry coke was strong throughout the year in the south and justified the development and improvement at old and new ovens made in that section. The Gulf States Steel Corp. built 37 Koppers by-product ovens and the Woodward Iron Co. 60 Wilputte by-product ovens. The Sloss-Sheffield Steel & Iron Co. leased mines and bee-hive ovens at Sayre, Ala., and practically all coke producers in the district rehabilitated old plants. It is estimated that the output of coke for 1917 in Alabama alone was approximately 6,000,000 tons, a marked increase over production in 1916. Spot foundry coke sold at as high as $16 per ton. At the opening of the year this grade was selling at between $6 and $7, while some contracts at $4.72 still were in existence. There was a steady increase in prices and demand grew so rapidly that orders were reduced. Some of the new furnace companies had to go outside the district to get supplies with which to start their plants. Since the government price schedules have been in effect small lots have been sold.

By-product coke is the principal fuel used in the Chicago district by both blast furnaces and foundries. Throughout 1917 the supply of by-product coke in the west was much below requirements.

Rail Orders Decline Sharply in 1917

STEEL rail bookings in 1917, as foreshadowed by the record-breaking purchases in the preceding year, which included large tonnages for as far ahead as 1918, were comparatively small. The bulk of the large inquiries appearing in the year both from domestic and foreign sources, could not be accepted due to the greater need for other finished steel products for the war purposes of the United States and its allies. In fact, virtually every rail mill in this country during 1917 was pressed into the production of large rounds for shell manufacture. The extent to which rail mills were devoted to the latter class of production led to failure in many instances to make deliveries on old rail contracts so that large tonnages, in many cases booked 15 to 16 months ago, are going over for rolling in 1918. Prices as quoted by the leading makers were unchanged during the year at $38 for standard bessemer and $40 for standard open-hearth rails, but these figures were largely nominal during the last nine months. Some makers sold at much higher prices. The Colorado producer in June quoted $45 on open-hearth rails and about the middle of July it sold several tonnages to western roads for 1919 delivery at $50, mill. In November, while the trade generally was awaiting the establishment of a government price, one maker quoted as high as $75, mill, on an inquiry for 14,000 tons for the Texas & Pacific. Price variations also were reflected by small sales of standard rails. In April, lots of 300 tons or less for terminal and switch work and for crane runways and other industrial purposes were selling at $50 to $60, eastern mill. By December such lots were at $80 to $90 and in some cases 5c per pound was done up to 100 tons. In many cases, small tonnages of second quality rails brought the same prices as first quality. By the middle of the year, light rails, including sections weighing from 25 to 40 pounds were bringing around $70. Light rails at all times were as difficult to obtain as standard rails. On Nov. 20, when the market on light rails stood at all the way from $60 to $85, the general committee of the American Iron and Steel institute, in agreement with the government, established the price of light rails at 3c mill, or $67.20 per gross ton.

Outside of government requirements, the greater portion of the rails placed both from domestic and foreign sources during 1917, was entered prior to May. It is estimated that total bookings during the year were 1,250,000 to 1,500,000 tons, compared with 4,500,000 to 5,000,000 tons in 1916. Of the 1917 bookings, at least 200,000 tons were for export. The latter figure does not include the 150,000 tons of 80-pound rails which the United States government distributed in July for the construction of a military railroad in France. Of this business, 90,000 tons went to the United States Steel Corp. and the remaining 60,000 tons to independents, all at a tentative price of $40, mill. Shipments of most of this tonnage were completed by Oct. 1. The government, in August, divided an order for 23,000 tons of 25-pound rails equally between the Lakewood Engineering Co. and the Lorain Steel Co., for military use in France. During October and November, at least 60,000 tons were placed by the government for federal shipbuilding establishments, quartermasters' supply depots and similar plants in this country.

At the beginning of the year, the Pennsylvania railroad had an inquiry out for 205,000 tons for 1918 but this was withdrawn in January. In March, this road placed 68,232 tons, half of which went to the United States Steel Corp. and the remainder to the Bethlehem Steel Co., the Cambria Steel Co. and the Lackawanna Steel Co. All this tonnage was placed at $40.80, mill, an extra of 80 cents being charged for a nick and break test. In October, the New York Central secured reservations for 150,000 tons for 1919, although no formal contracts were made; half of this business was booked by the United States Steel Corp., and the remainder by independents. These were the heaviest domestic orders placed during the year. At the close of the year, heavy inquiries were pending, principally for 1919 delivery. Many export inquiries came into this market during the year; Russia asked 200,000 tons, England 40,000 tons, and Sweden 25,000 tons. Good sized inquiries came from Cuba, Denmark, Porto Rico and other foreign sources but they did not result in business. The largest inquiry which came out was from the Persian Gulf & Mesopotamia Co., of London, which requested prices on 232,000 tons of 65-pound rails to British specifications, together with complete railroad equipment. France placed around 125,000 tons of rails and light rails and Italy 40,000 to 50,000 tons in 1917. Exports of rails from this country during the first 10 months of 1917 totaled 422,453 gross tons compared with 442,202 gross tons for the same portion of 1916.

Definitely reported rail orders, by months for recent years, compiled by THE IRON TRADE REVIEW follow:

	1917	1916	1915	1914
Jan.	175,000	200,000	200,000	175,000
Feb.	170,000	140,000	150,000	215,000
Mar.	140,000	800,000	160,000	60,000
Apr.	185,000	800,000	65,000	60,000
May	75,000	75,000	140,000	110,000
June	10,000	125,000	225,000	215,000
July	195,000	500,000	240,000	130,000
Aug.	50,000	100,000	145,000	70,000
Sep.	175,000	50,000	325,000	40,000
Oct.	100,000	325,000	590,000	30,000
Nov.	25,000*	500,000	150,000	115,000
Dec.	.....	500,000	200,000	30,000
	1,300,000	4,115,000	2,590,000	1,250,000

*Estimated.

Home Output Meets Ferro Demand

Falling Off of Imports and Obstacles to Bringing in Foreign Ore Cause Difficulties to Steel Industry and Lead to Record Domestic Production—Spiegeleisen is Substituted for Ferromanganese—Spot Prices Soar

IN THE face of difficulties which on some occasions produced a dubious outlook American ferromanganese production again rose to the nation's requirements in 1917. Imports fell off nearly 50 per cent as compared with 1916, but the domestic output increased 20 per cent, reaching the record-breaking total of about 328,000 tons. Prospects for an insufficient supply became grave at times during the year, but, due in considerable measure to a conservation policy adopted by the trade, there was enough constantly to go around. Imports of ferromanganese from England showed a consistent falling off throughout the year. English offerings, with the exception of sales of a few hundred tons in June, practically ceased in April as a market factor. This development, combined with the difficulty in securing vessels for bringing in manganese ore, gave such concern, that in May, a committee of ferromanganese makers and dealers was organized to mobilize the situation. This committee took a census to show the requirements of individual consumers, the stocks held by consumers and dealers, the total output of the country and the probable imports. Although the census showed the supply on hand was sufficient to meet the country's requirements for three months, steps were instituted to safeguard this stock. Among the recommendations made was the substitution of spiegeleisen for ferromanganese wherever practicable. The carrying-out of this recommendation by many consumers was a factor leading to an increase toward the end of the year in the amount of metal available in the market. Ferromanganese and the other ferroalloys were among the few products in the iron and steel industry not affected by government regulation of prices. At the close of the year, the application of price control to the ferroalloys was regarded as among the remotest of possibilities. Such price-fixing, owing to our dependence upon foreign ores, necessarily would be to some extent an impracticable undertaking.

Eastern furnaces, because of their accessibility to tidewater ports, made a large percentage of the domestic ferromanganese during 1917, particularly that which was disposed of in the open market.

Those makers who engaged in the manufacture of either ferromanganese or spiegeleisen during 1917 were as follows: Illinois Steel Co., Joliet; Miami Products Co., Chicago; Bethlehem Steel Co., Sparrows Point, Md., and Lebanon, Pa.; American Manganese Mfg. Co., Dunbar, Pa.; Carnegie Steel Co., Pittsburgh; Juniata Furnace & Foundry Co., Newport, Pa.; Lebanon Blast Furnace Co., Lebanon, Pa.; New Jersey Zinc Co., Palmerton, Pa.; Colorado Fuel & Iron Co.; Donner Steel Co., Inc., Buffalo; Seaboard Steel & Manganese Co., Temple, Pa.; Tennessee Coal, Iron & Railroad Co., Bessemer, Ala.; Berkshire Iron Works, Sheridan, Pa.; Wharton Steel Co., Wharton, N. J.; E. J. Lavino & Co., Watts, Pa.; E. E. Marshall, Harrisburg, Pa.; Oriskany Ore & Iron Corp., Lynchburg, Va.; Southeastern Iron Corp., Goshen, Va.; and John B. Guernsey & Co., Inc., Graham, Va.

Prices on spot ferromanganese equaled but did not surpass the record-breaking level which prevailed in March and April of 1916. The market in January opened at $175, and the price increased rapidly until in April, spot carloads were bringing all the way from $400 to $450, delivered, which was the highest level of the year. In July, when general market regulation by the government first definitely was foreshadowed, demand for all ferroalloys was reduced to a minimum owing to the uncertainty as to how such regulation would affect values. The continued dullness of demand led to a decline which at first was easy and later became headlong. The bottom was reached in November, when spot ferromanganese was selling at $225 to $250, delivered. Unofficial assurances that prices on ferroalloys would not be controlled, at that time led to an improvement in demand, which in conjunction with the great difficulty in obtaining vessels for importing manganese ore, strengthened the tone and advanced prices. Early in February, domestic makers were quoting first half at $200 to $250, third quarter at $200, and last quarter at $185. On March 1, the second quarter price was $275 to $300, third quarter $225 to $275, and fourth quarter $200 to $250. Early in July, $400 to $425 was quoted for shipment over the remainder of the year, $375 to $400 for first quarter, and $350 for first half. About the middle of August, $375 to $400 was quoted for the remainder of 1917, and $350 for the first quarter and first half of 1918. About the middle of November, $225 to $250 was quoted for all deliveries. By the middle of December, the market on all deliveries had strengthened to a minimum of $250.

On English ferromanganese the price in January was $164, seaboard, at which time a large tonnage was sold for the last three quarters of the year. Early in February, additional tonnage was sold at this price and an advance then was made to $185, at which at least 5000 tons were marketed for last half. Late in March, several tonnages were sold for second quarter at $205, which was followed by moderate sales at $210. Several hundred tons were sold about the mid-

Imports and Domestic Production of Manganese Alloys; Imports of Manganese Ore

	Production		Imports		Imports
	Ferro-manganese	Spiegeleisen	Ferro-manganese	Spiegeleisen	Manganese ore
1917	328,000	*187,000	*51,800	.....	*663,500
1916	275,204	187,233	90,928	.....	576,321
1915	144,260	114,556	55,263	200	313,985
1914	100,731	76,625	82,997	2,870	283,294
1913	119,495	106,980	128,070	77	345,090
1912	125,378	102,561	99,137	1,015	300,661
1911	74,602	104,013	80,263	20,970	176,852
1910	71,376	153,055	114,228	25,383	242,348
1909	82,209	142,831	88,934	16,921	212,765
1908	40,642	111,376	44,624	4,579	178,203
1907	55,918	283,430	87,400	48,994	209,021
1906	55,520	244,980	84,359	103,268	221,260
1905	62,186	227,797	52,841	55,457	257,033

*Estimated.

dle of April for first quarter of 1918, at $230, and late in June several hundred tons for first half were disposed of at $375. The last sale was of a small tonnage, which went at $400 in July, for shipment in November. This business was booked subject to the granting of licenses by the British authorities. Up to the end of March, English makers managed to ship enough ferromanganese to fill their contracts, but in April, the amount of metal for which licenses were granted was only about 50 per cent of the tonnage for which permits were secured in January, and from then on it became increasingly difficult to secure such permits. In April, the British ministry definitely adopted a policy of refusing to grant further licenses for ferromanganese, except when exported for use by consumers making steel for the allies. It is known that at least 5000 tons, and probably a good deal more, of English ferromanganese was sunk by submarines while en route to this country.

Spiegel Prices Not So High

Spiegeleisen prices did not compare with those established in 1916, and in fact, the figures obtained for this metal were low when contrasted on the unit basis with those obtained for ferromanganese. Substitution of spiegeleisen for ferromanganese therefore not only was advisable for the conservation of the latter, but it resulted in economies to some buyers. The market on spiegeisen in the year opened strong at $55 to $60, furnace. In February, first half prices were quoted at $65 to $75, furnace. Deliveries after July were quoted at $60 to $65. As early as March, inquiries began to come out for 1918, and during that month prices generally prevailed at $75 for shipment prior to Oct. 1 and $60 for beyond. In April, quotations on fourth quarter varied from $60 to $65, but prices on this position were advanced so that by the middle of April, $75 was being asked for the entire year. In May, about 5000 tons of 20 per cent English spiegeleisen were sold at $79, tidewater, for forward delivery. The highest prices reached were in June, when the market on spot was quoted at $85 to $87.50, furnace, with last half at $82 to $85, and first half of 1918 at $75. During the second half, prices declined first slowly and then rapidly until about the middle of November, as low as $59, furnace, for this year and 1918 was done. In December, prices showed a firmer tendency, with $60 as the minimum for all deliveries.

Difficulties in obtaining manganese ore were encountered throughout the year and led to the payment of record prices. While ore, as usual, was obtainable in any quantities at its sources, the great problem was to secure ships for its transportation here. In many cases, it was impossible to secure vessels even by offering fabulous freight rates. On one typical occasion, a seller in this country chartered vessels successively only to have them commandeered and it was not until he had engaged the tenth vessel, that he was able to bring over a cargo of Indian ore. In November and the early part of December, the question of vessels became particularly acute, owing to the great need for vessels for carrying supplies to Italy. At the beginning of the year, Indian and Brazilian manganese ore were sold at 72 and 73 cents per unit at tidewater for second quarter delivery. In the latter part of February, spot Brazilian sold at 73 cents and cargoes leaving India during the first quarter went at 75 and 76 cents per unit at tidewater. At the beginning of April, Brazilian ore sold at 87½ cents per unit for manganese and 10 cents per unit of iron, at tidewater. By August, the maket on foreign ore had reached a minimum of $1.15 per unit at tidewater and from the middle of that month until the end of October, the prevailing prices were $1.20 to $1.25 per unit at seaboard, the highest figures ever known. Early in December, Indian ore for 1918 was sold at $1.10 per unit. Several sales of Brazilian ore were made about that time on the basis of 65 to 70 cents, f.o.b. Rio Janeiro, leaving to the buyer the question of securing shipping space. On domestic ore, the base price was advanced in May from 80 cents to $1 per unit and this price further was advanced on Oct. 25, to $1.20, delivered at consuming points for 50 per cent ore and higher, with differentials for ore having a lower manganese content. Not all the difficulties originated in the shipping situation. In the early part of the year, practically all Cuban manganese ore operations were shut down due to lack of men, damage to property and interference with insurrection in that country. By May, transportation resulting from the inhowever, the Cuban production was being maintained under better conditions and the important mines were being worked under the protection of troops furnished by the Cuban government. In Brazil, car and labor shortages occasionally caused considerable delay in the bringing down of ore and the loading of vessels.

Domestic mining of manganese ore was stimulated greatly by the high prices prevailing and the production was comparatively large. The government is lending its efforts to broaden the home supply of ores for the manufacture of manganese alloys.

Fifty per cent ferrosilicon was scarce all through the year, and during the first four or five months, was almost unobtainable. During that time some melters, not being able to obtain the usual quantities, paid 25 cents per pound for small emergency lots. At that time, the commandeering of power by the Canadian government at Niagara Falls, held output in that district to approximately one-third of capacity, forcing producers to cut down their contract shipments and preventing them from offering spot. For the occasional carloads which were offered from various sources during the first half, it was easy to obtain $250, and in some cases as high as $265 was paid. Concerned over the scarcity, some consumers, as early as June, placed contracts for first half of 1918 at $140, delivered. Later in that month first half became established at $130. Early in July, the supply became easier, and prompt and the remainder of the year could be done at $225, which gave way toward the latter part of the month, to $200. In October and November spot was more plentiful and as low as $150 was done. In December, however, prices showed a stronger tendency. Bessemer ferrosilicon brought high prices in the latter part of June, when as high as $105, furnace, was paid for 11 per cent. A general strike in the Jackson, O., district, temporarily was accompanied by a severe curtailment in production during May.

Prices Vary Widely

Average contract prices of ferromanganese at seaboard during 1916 and previously, and delivered during 1917, are as follows:

	1917	1916	1915	1914
Jan.	$175.00	$110.00	$68.00	$36.00
Feb.	192.50	140.00	100.00	38.00
Mar.	212.50	175.00	100.00	38.00
Apr.	250.00	175.00	100.00	38.00
May	375.00	175.00	100.00	38.00
June	400.00	175.00	105.00	37.50
July	400.00	175.00	103.00	37.50
Aug.	387.50	170.00	105.00	100.00
Sep.	380.00	164.00	110.00	80.00
Oct.	300.00	160.00	105.00	66.00
Nov.	247.50	155.00	100.00	66.00
Dec.	.....	162.50	100.00	68.00

Average monthly prices for 20 per cent spiegeleisen, furnace, for the past three years have been as follows:

	1917	1916	1915
January	$57.50	$32.50	$25.00
February	66.25	42.50	25.50
March	77.50	55.00	26.00
April	76.75	60.00	26.00
May	78.00	60.00	26.00
June	83.00	55.00	26.00
July	85.00	47.50	26.00
August	81.25	47.50	26.00
September	80.50	45.00	29.00
October	73.50	40.00	30.00
November	63.25	45.00	30.00
December	.....	50.00	30.00

Shell Steel Demand Crowds Market

Addition of United States to List of Belligerents Increases Difficulties of Mills in Filling Ordinary Requirements—Prices Advance to Record-Breaking Peak in July Then Soften as Government Regulation Appears

HUGE demands for semifinished products were made upon rolling mills throughout the country during 1917. Makers enter the new year with their books so completely filled that many consumers are left without tonnages and no prospect of getting them. The United States having become a belligerent, capacities already taxed heavily were strained to the utmost to meet the vast new requirements which were given precedence. These, together with the great tonnages taken by the entente, pushed domestic buyers in the background and only by giving the most careful consideration to the wants of their regular customers were the mills able to approach a satisfactory distribution of their output. They were compelled to withdraw from the market leaving unsatisfied many heavy requirements which consumers eagerly sought in vain to cover.

Features of extraordinary and unexampled character prevailed in the market. Prices reached unprecedented levels and it is not possible to say how they would have gone had it not been for government regulation. Billets advanced 66 per cent and sheet bars 75 per cent in the year. Demand was made for all kinds of tonnages from ¾-inch to 16-inch rounds for the manufacture of shrapnel to heavy blooms. In November practically 1,500,000 tons of various-sized rounds and billets for shell making were awarded to steel mills, under the allotment plan followed by the American Iron and Steel institute.

The order was sub-divided and consisted of shell-body steel to be used for shells ranging from 0.4-inch to seacoast size; also between 40,000 to 50,000 tons of cold rolled steel for fuses, and between 4500 to 5500 tons of deep drawing steel for adapters. Shipments of the aggregate order are being made at the rate of between 200,000 and 225,000 tons monthly. At the same time the institute committee also distributed orders for 4.2 and 6-inch shells for one of the allied governments.

The exceptional demand for all finished products prevented most steelmakers from marketing as great a proportion of their semifinished output in the year as in normal periods. So acute was the scarcity that many plants, especially those consuming forging billets, had to close down occasionally or curtail their schedules because of their inability to obtain raw material.

At the outset of 1917 mills were taking but little business, being filled to capacity for the first quarter. Specifications against contracts were heavy and consumers were concerned over deliveries. In the Pittsburgh and valleys districts traffic conditions were particularly bad and users of such tonnages as sheet bars and billets suffered from deferred shipments. Shell steel orders were pouring into the mills in all districts and had to be given immediate attention, thus complicating the situation. Orders of from 100,000 to 150,000 tons of shell steel were placed with valley makers the second week in January. Still heavier tonnages were placed in the Pittsburgh district, and proportionate amounts went to other producing centers. In the valleys at that early date, shell discards in 500 to 1000 ton-lots and more were sold at $43. In the east open-hearth rerolling billets were sold at the opening of the year at $60, mill; shell discards at $45, mill; and skelp at 4c to 4.25c, mill. Levels in the Pittsburgh district were on a similar basis. Bessemer and open-hearth sheet bars, at $60 to $65, and wire rods at $80, Pittsburgh, were in great demand at the beginning of the year. Muck bar commanded $50, Pittsburgh.

July Shows Highest Prices

Wire rods were sold around May 1 at $85, mill. A great portion of the tonnage was for export. The highest level was reached in July, when the minimum average was $95. Open-hearth and bessemer sheet bars and billets also reached their highest prices that month, with an average of $105 and $100 respectively. Forging steel went as high as $130.

Rerollers for export commanded $78, New York, early in May and were sold at about the same level for domestic use. Forging billets then were selling at $90, delivered eastern Pennsylvania. About the middle of May, rerollers were sold by an eastern maker at $90, delivered eastern Pennsylvania, and forging billets were advanced to $115, while slabs were sold in the east by a Pittsburgh mill at $85, Pittsburgh. At the same time shell discards were being sold in the east at around $55, Pittsburgh and Youngstown. By the middle of February makers in the Pittsburgh and valleys districts were selling forging billets at $100. Virtually every consumer in western Pennsylvania and eastern Ohio was after tonnage for the second quarter.

Toward the middle of the year it was rather difficult to sell shell discards in the east at $55, Pittsburgh, and as prices for scrap were reaching record-breaking levels, several mills began remelting a portion of their discards. Some tonnages were sold at $48 and $50, mill. By the middle of June, sales of open-hearth slabs were made around $110, eastern mill, and forging billets at $125. In July bessemer wire rods were sold for export at $93 to $94, New York; open-hearth rods for France at $95, New York, and rerolling billets commanded $90 to $100, delivered eastern Pennsylvania. Early in August prices in the east went up to $140, delivered, on forging billets and rerollers commanded $115. Muck bar was sold at $75, Pittsburgh. Then the market began to soften. During the two or three weeks before prices were fixed, French buyers closed for about 25,000 tons of open-hearth wire rods around $88 to $92, New York. Sales were made rather freely at this time by Pittsburgh and valley producers, soft basic rods going around $85 to $87, while high carbon rods were sold around $95, Pittsburgh. Rerolling billets for export were sold at $95 and higher, eastern Pennsylvania, and at equivalent prices in western Pennsylvania and eastern Ohio.

Difficulty was experienced during all of 1917 in obtaining billets and sheet bars, especially the latter. Toward the close of the year finishing mills were combing the market in a futile attempt to obtain tonnage. Mills in Pittsburgh and the valleys quoted billets and sheet bars at $65 to $70 early in February for shipment in April, May and June and received a heavy demand. They had but little tonnage available for early delivery. By March 1, practically all makers had sold their sheet bar and

billet capacity for second half. Toward the latter part of March billets and sheet bars, both open hearth and bessemer, were sold at $70 to $75, mill. Soon after open-hearth sheet bars took a sharp upward turn and early in May commanded $90 for prompt delivery. About one week later they were sold at $100. Billets had advanced to $75 and $80 by early May. In the mid-month lots of 1000 tons of open-hearth sheet bars were sold by Pittsburgh makers for third quarter at $95 and $100. A finishing mill in the Pittsburgh district at that time paid $95 for ordinary soft steel 4 x 4-inch bessemer billets. An inquiry was out then for 61,000 tons of round billets for export to foreign shellmakers and the business was said to have gone to Pittsburgh and valley producers.

Shortage of steel and lack of vessel space made it unusually difficult to place export business during 1917. By June it was estimated that at least 500,000 tons of semifinished steel had accumulated at Atlantic ports due to insufficiency of cargo space. In most cases where shipment was made to a port, the steel could not be taken aboard because the vessel space that had been reserved for it had been reassigned at the last minute to food or other supplies. Necessarily the difficulty in moving steel lessened the export demand since buyers realized it was a waste of effort to order steel if it could not be shipped. Numerous lots of shell steel were placed by French, British and Italian buyers. Large inquiries came from Russia.

Limited offerings of semifinished steel have been made since the fixing of prices. Various sales of sheet bars at $51, Pittsburgh and Youngstown, of slabs in the east at $50, Pittsburgh, and of open-hearth rerollers at $47.50, Pittsburgh, were made, however. Prices established by the government represented sharp reductions from those that had prevailed in the open market. Levels for bessemer and open-hearth billets and sheet bars were fixed at $47.50 and $51, respectively, Pittsburgh and Youngstown; for No. 5 wire rods at $57, Pittsburgh, and for grooved and sheared skelp at 2.90c and 3.25c, Pittsburgh, respectively.

Tin Plate Mills Meet War Demands

TIN PLATE makers are entering the new year with complete confidence that they can meet the enormous demands that have been and are being made upon them. With new mills put into operation in 1917, the theoretical maximum annual tin plate capacity of coated tin mill products is approximately 38,000,000 base boxes, or about 2,000,000 net tons. Although export demand is extremely heavy when compared to the tonnage that went abroad prior to the war, it is relatively small when considered in connection with the output. In the first nine months of 1916 exports of tin and terne plate totaled 172,687 gross tons, as against 179,147 gross tons for the same period in 1917. There are obstacles that may curtail production of tin plate in 1918 to a point below requirements.

Books were opened by producers in November for first half business, which was closed at the government price of $7.75 per base box, bessemer or open-hearth. With the mills supplied sufficiently with steel, tin, palm oil and sulphuric acid and labor conditions satisfactory, there will be no lack of tin plate. The price of $7.75 is the highest at the opening of any season in the history of the American tin plate industry and is 25 cents a box over the price at which books were opened on April 4, 1917, for last half. Preceding this latter price was that of $5.75, at which the American Sheet & Tin Plate Co. opened its books on Oct. 12, 1916, for delivery during the first half of 1917. Independents had opened books on Oct. 7, 1916, at $6 for first half delivery.

Demand for tin plate in 1917 from all parts of the world, with resultant unprecedentedly high prices, not only attracted more capital and caused more mills to be built, but led existing plants to tin a much greater proportion of their black plate production than is ordinarily the case. The bureau of foreign and domestic commerce, department of commerce, in a statement issued last fall, said this practice will be followed in 1918, judging from figures made public by the tin-plate conservation committee.

War Demands are Heavy

Heavy demand for tin plate for strictly war purposes has come to makers. All small cartridges are partitioned with tin plate and then they are enclosed in a tin box and soldered up air and watertight. The larger shells are placed in individual cans, a 3-inch shell, for example, being sealed in a can 3 inches in diameter by 18 inches long. This is only one of the many demands being made on tin plate outside of the food consuming trade.

In the food trade, increased demand has been phenomenal. For instance, milk, one of the most essential army rations, is being packed in tremendously increased quantities; one concern which bought 18,000,000 cans from the American Can Co. in 1916, had purchased 19,000,000 cans up to May 1, 1917, according to President H. W. Phelps, and on May 1 placed specifications for 68,000,000 cans more to cover the remainder of 1917 requirements.

At the beginning of 1917 makers declined to book contracts for shipment after July 1. Prices as high as $8 and $8.25 per base box were received by the middle of February and kept advancing. Sales for export were made in July at fabulous levels which went up to $20 and $22. These prices were obtained by second hands principally. The highest average monthly price was in July at $10, which was maintained through August, September and October, although most makers were out of the market after July. Shipping orders for more than 300,000 boxes for export were given early in December against 500,000 boxes which had been allotted previously.

New capacity that went into operation in 1917 included six mills of the Wheeling Steel & Iron Co., Yorkville, O.; 10 mills at the New Castle, Pa.; 10 mills at the Farrell, Pa., and 24 mills at the Gary, Ind., plants of the American Sheet & Tin Plate Co., and 12 mills at the Sparrows Point, Md., plant of the Bethlehem Steel Co. On March 1, the Liberty Steel Co., Warren, O., will begin to make shipments from an eight-mill plant. The American Steel Co., Waynesburg, Pa., remodeled and put into operation four mills. This makes a total of 74 hot mills with an annual capacity of approximately 5,920,000 base boxes. Some of the mills also increased their tinning capacity, including N. & G. Taylor Co., Philadelphia; Trumbull Steel Co., Warren, O.; Phillips Sheet & Tin Plate Co., Weirton, W. Va.; Carnahan Tin Plate & Sheet Co., Canton, O., and the American Sheet & Tin Plate Co.

The bi-monthly sheet and tin plate sliding wage scale settlements made at Youngstown on Nov. 12, showed an average realized price of $8.10 for tin plate. The wage rate for November and December was $0.903 per 100 pounds, the highest ever paid, compared with $0.527 for January and February, and $0.848 in September and October.

Plates Bear Heaviest War Burden

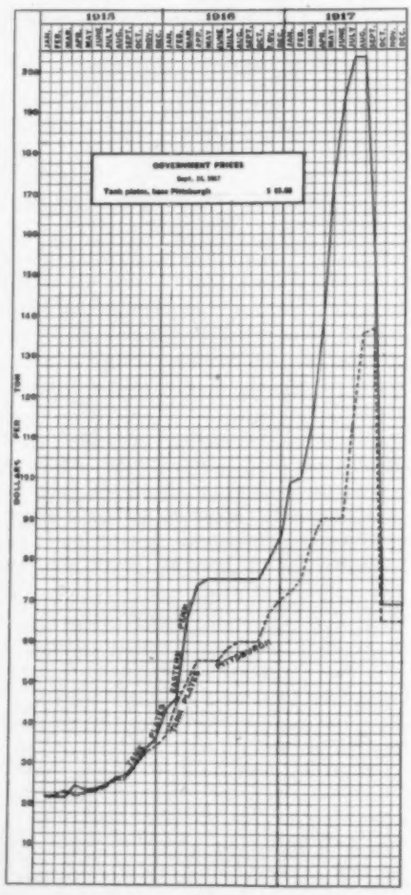
Mills Are Choked by Worldwide Demand at Phenomenal Prices Until Called Upon by Government to Furnish Huge Preferred Tonnage for Ships and Other Military Needs at Greatly Reduced Level

STEEL plates were elevated to a new dignity in 1917. While large tonnages of all kinds of finished steel products were required for war purposes, it was on the country's tremendous capacity for rolling plates that the government was able to rely basically in formulating its shipbuilding program. Plate orders placed by the end of the year for use in shipbuilding, for carrying out the naval schedule, for cars, locomotives, mines, tanks, and countless other direct and indirect war requirements, were absorbing at least 75 per cent of the entire output. Numerous mills, in fact, were operating 100 per cent on government work. Toward the end of the year, government requirements had grown to such volume that they dominated the entire market, and other needs, when the mills consented to accept them, were booked subject to the understanding that government work would be handled first.

All through the year and particularly in the first half, demand was of such proportions as to stagger the imagination. Nothing like the huge inquiries then current, which were utterly beyond the capacity of the mills to book, existed in the memory of the oldest veteran in the industry. During this period the mills thought it unusual if they did not decline to consider inquiries totaling on an average of 100,000 to 200,000 tons weekly. This demand came not only from all kinds of consumers whose requirements had been greatly augmented directly or indirectly by war conditions, but particularly from shipyards in all quarters of the globe which were trying to meet the tremendous demand for ocean tonnage. As early as January orders began to be placed for 1918 and by the end of the first quarter few mills had anything left to sell for 1917. New offerings did not lose their terrific momentum until about the middle of the year. By that time the shipbuilding industry in this country had become nationalized and shipyards were beginning to look to the government instead of to the mills direct for their supply of steel. The mills from that time on discouraged new demand wherever possible, due not only to their already sold-up condition, but also to their desire to hold themselves in reserve for government wants. Plates became so hard to get that structural fabricators even found it impossible in many cases to secure protection on which to base estimates for new construction work they wished to bid for.

Export Shipments Checked

The foreign demand was restricted automatically by the working of the export license policy which became effective July 14, and plate shipments abroad practically ceased on Aug. 15, when the export embargo became operative. The effect of the embargo was particularly drastic with respect to Japan. It was estimated in August that shipments of fully 400,000 to 450,000 tons of steel for that country, of which plates comprised the greater portion, were held up by the embargo. As it was considered likely that arrangements would be effected between the American and Japanese governments whereby steel again would go forward to Japan, many Japanese buyers had tonnages shipped from the mills to the Pacific coast points, in order that they might be available for quick shipment. As a result of this movement, particularly of plates, the accumulation of finished steel at Pacific coast terminals became so acute that in November the railroads embargoed further shipments of this character. Through the United States government further large orders continued to be placed for our allies although they constituted only a fraction of the tonnages that were wanted. For instance, toward the close of the year, England, France and Italy urgently were endeavoring to secure reservations here for a total of at least 1,000,000 tons of plates for delivery in 1918.



TANK PLATE PRICES 1915-1917

Up until the second half, prices almost each week became established at a new record level. The highest prices were those in May and June, when the minimum on tank plates was 10c, Pittsburgh, for any delivery. Prices on Lloyd's specification ship plates then ranged all the way from 11c to 12.50c. Marine steel, United States standard, sold in round tonnages at as high as 20c and round tonnages of Lloyd's boiler steel changed hands at 15c. Tank plates were so difficult to obtain that all kinds of fancy prices were offered and in July moderate tonnages were sold in exceptional cases as high as 12c. The price established a high record.

Shortly after the entrance of the United States into the war, a special price of 2.90c, Pittsburgh, was agreed upon for application to plates for the naval program, which then totaled 610,000 tons of plates, shapes and bars, and this business was distributed among the mills through a general committee of the American Iron and Steel institute in proportion to their capacity. Later other large tonnages for the government were distributed through the same medium, but at prices to be determined in further conferences between the steelmakers and the government. On Sept. 24, the agreed price was fixed at 3.25c, for application not only to government orders but to general domestic business. Several large makers expressed satisfaction

with the 3.50c price, but numerous smaller mills and also some of the large makers whose production is made up largely or wholly of plates, complained that they would be unable to come out whole at the new price. In conjunction with the export embargo, the 3.25c price worked considerable hardship to some of the mills that had large orders on their books for Japan and other countries. In many cases, these plates were rolled from high-priced raw material which made it impossible to resell them without a loss. Accordingly, some of the plates which originally were sold for export were resold at the highest prices the sellers could get. These ranged in September and October from 6c to 8c. By the end of the year it appeared that practically all of this tonnage had been cleaned up.

Sell at Fixed Price

For the first two or three weeks after the 3.25c price went into effect the mills generally refrained from offering at the new figure. Toward the end of October, however, limited tonnages, principally of universal plates, were sold and a number of the mills, finding that government requirements would not take up all of their output, booked some first quarter contracts at 3.25c. Such business was taken only from regular customers, and subject to the understanding that government requirements in all cases must receive prior consideration.

Chicago Made Basing Point

A feature of the price agreement was the adoption of Pittsburgh and Chicago as common basing points. One disadvantage worked by this innovation was that mills shipping to distant points were required to base their quotations on the one of these two centers nearest the destination of shipment. For instance, eastern mills which received orders from the Emergency Fleet corporation to ship plates to Chicago for fabrication into ship steel, were instructed to quote 3.25c, Chicago. The ordinary method of quoting on such business, of course, would be on the basis of mill or Pittsburgh, the consignee to pay the freight.

Car and locomotive building under the impetus of war requirements of the United States and its allies assumed again large proportions during 1917, although the car orders placed did not total as large as for 1916. The government alone during the last half of the year placed 2014 locomotives for use in connection with our military operations in France. The largest buyer of cars also was the United States government, which placed 28,029 cars. All of these excepting 57 were for use in France. Orders were placed here for 40,200 cars for Russia, 12,000 for France, 572 for Java, 750 for Spain, 45 for Cuba, etc.

Car Orders Light

Total car orders placed with American builders by months as compiled by THE IRON TRADE REVIEW for the past several years are as follows:

	1917	1916	1915	1914
Jan.	15,000	21,700	2,500	13,000
Feb.	7,750	12,900	4,000	9,000
Mar.	21,500	8,750	1,100	7,500
Apr.	4,250	7,000	1,500	10,000
May	15,000	4,225	18,000	6,000
June	8,200	1,300	17,000	15,000
July	8,650	2,600	9,500	7,000
Aug.	13,000	15,025	3,000	1,100
Sep.	1,100	15,500	9,000	100
Oct.	42,800	26,000	22,500	50
Nov.	10,000	37,000	11,500	500
Dec.	1,000*	19,600	10,400	2,000
Total ...	148,250	171,600	110,000	70,250

*Estimated.

Year's Wire Needs Exceed Mill Output

MAKERS of wire and wire products entered 1917 with prices at $3 a keg, base Pittsburgh, to which they had been advanced Nov. 24, 1916. This advance represented $3 per ton. The mills then were sold up for several months and specifications against contracts were heavy. Demand continued to be extremely active, although the market was less excited during the latter part of January than it had been 30 or 60 days previously. Cut nails commanded $3.50 a keg the last week of the first month by several of the more prominent makers. Export demand for barbed wire was heavy during the early months but had fallen off greatly until during the last quarter this demand was light. One demand involved 100,000 tons from Russia.

On March 5 the price of nails was placed at $3.20 a keg, an increase of $4 a ton. The leading maker continued to quote this figure for several months. Demand for nails, plain wire, fencing wire, manufacturers' wire and wire rods was heavy and kept on this plane during the entire year. The requests for tonnages came principally from the allies and South America, while the United States government also was a considerable factor. Domestic requirements also involved heavy tonnages and makers succeeded moderately well in taking care of regular customers.

In October, the American Steel & Wire Co. increased prices $6 per ton, advancing wire nails per keg to $3.50, Pittsburgh, and fixing the price of plain wire at $3.25 per 100 pounds, Pittsburgh. The independents for some months since had been selling nails at $4 and other products at corresponding levels over the figures of the American Steel & Wire Co. The latter producer virtually was out of the market for a large portion of the year, owing to heavy bookings taken from the government and from its regular customers. When the government named a figure of $3.25, Pittsburgh, on plain wire in November all makers adjusted prices accordingly. The fixed price on plain wire was followed within a short period by announcements of $3.50 per keg, Pittsburgh, on wire nails, and $3.65 per 100 pounds, Pittsburgh, on painted barbed wire.

Italian Government Buys

In May, the Italian government gave the United States Steel Products Co. an order for 40,000 tons of barbed wire and 5000 tons of plain wire. All through the year there was an active demand from abroad and large quantities of all kinds of wire products, principally plain wire, barbed wire and wire nails, were sold to France and to a smaller extent to Japan and South American countries. Russia several times had out large inquiries for plain and barbed wire but nothing ever came of these. Toward the end of July the government, through the subcommittee on wire products, distributed orders among eight leading makers for 16,000 kegs of nails for the 16 national army cantonments. Later more nails were distributed for the cantonments and also for the various aviation and national guard encampments, and in addition, for United States military construction in France. The grand total appears to have been about 130,000 kegs. About the same time orders were allotted by the government through the wire rope committee for large quantities of wire rope. Orders for several million dollars worth of insulated wire for the signal service also were distributed through the wire and cable committee of the advisory commission of the council of national defense.

Sheetmakers Endure Trying Year

Shortage of Steel and Labor and Inadequate Traffic Conditions Hamper Production When Demands Augmented by War Necessities Reach Tremendous Scale—Much Tonnage Sold for First Half of 1918

MILITARY requirements took enormous tonnages of sheets in 1917. Mills devoted large portions of their capacities to government needs. The percentage of federal tonnages appeared especially large because it was placed on top of domestic orders which had congested the mills. As in all lines of iron and steel, prices reached unprecedented levels. The year entered on a rising market and it advanced sharply up to July, when price-fixing by the government first was discussed. In reality a runaway market prevailed. Combined with demands for the military purposes of the United States and the entente allies, there was an active domestic inquiry during most of the year. But it was not fully met at some period. Sheetmakers were unable to take care of all private business because of war demands. They were forced to curtail production at intervals owing to a shortage of steel, bad traffic conditions and a lack of labor. Shortage of steel now is greatly interfering with operations, which are being maintained at not over 70 per cent of capacity. Many customers will have to go without adequate tonnages for the first half of 1918. Sheet contracts for that delivery are estimated at about 900,000 tons, mostly for domestic use. Producers of nonessentials have been cut off the list of buyers by the sheet manufacturers and others have been unable to make contracts for tonnages.

Prices Go Up Steadily

In the Pittsburgh district the market early in January, 1917, was quoted at 4c to 4.75c for No. 10 blue annealed sheets; black at 4.50c to 5.50c for No. 28 black, and at 6.50c to 7.50c for No. 28 galvanized. The highest levels were reached in July, when the average minimum prices on these grades were 8.50c, 9c and 10.25c, respectively, Pittsburgh. These figures held throughout August, but there was a slight recession in prices of black and galvanized sheets in September. The market softened considerably in October, shortly before government prices were eestablished. Foreign orders were taken frequently at prices considerably higher than those prevailing in the domestic market. At the opening of 1917, makers of farm machinery and electrical equipment asked the mills to reserve tonnages for the second half and were not much concerned about prices. No producers at that time, however, had opened their books for delivery after July 1.

The American Sheet & Tin Plate Co., April 4, opened its books for second half, and during the month sold practically all of its bessemer tonnage for that period at 5c for No. 10 blue annealed, 5.50c for No. 28 black, and 7c for No. 28 galvanized, Pittsburgh. For sheets rolled from open-hearth steel an extra $5 a ton was asked. The government prices fixed Nov. 5 were 4.25c for No. 10 blue annealed, 5c for No. 28 black, and 6.25c for No. 28 galvanized, either bessemer or open-hearth, Pittsburgh. Differentials were fixed by the American Iron and Steel institute in accordance with past trade customs. Books were opened shortly after. Contracts for blue annealed and black sheets were taken for the first half and for galvanized for first quarter.

There was a shortage of galvanized sheets at the beginning of the year

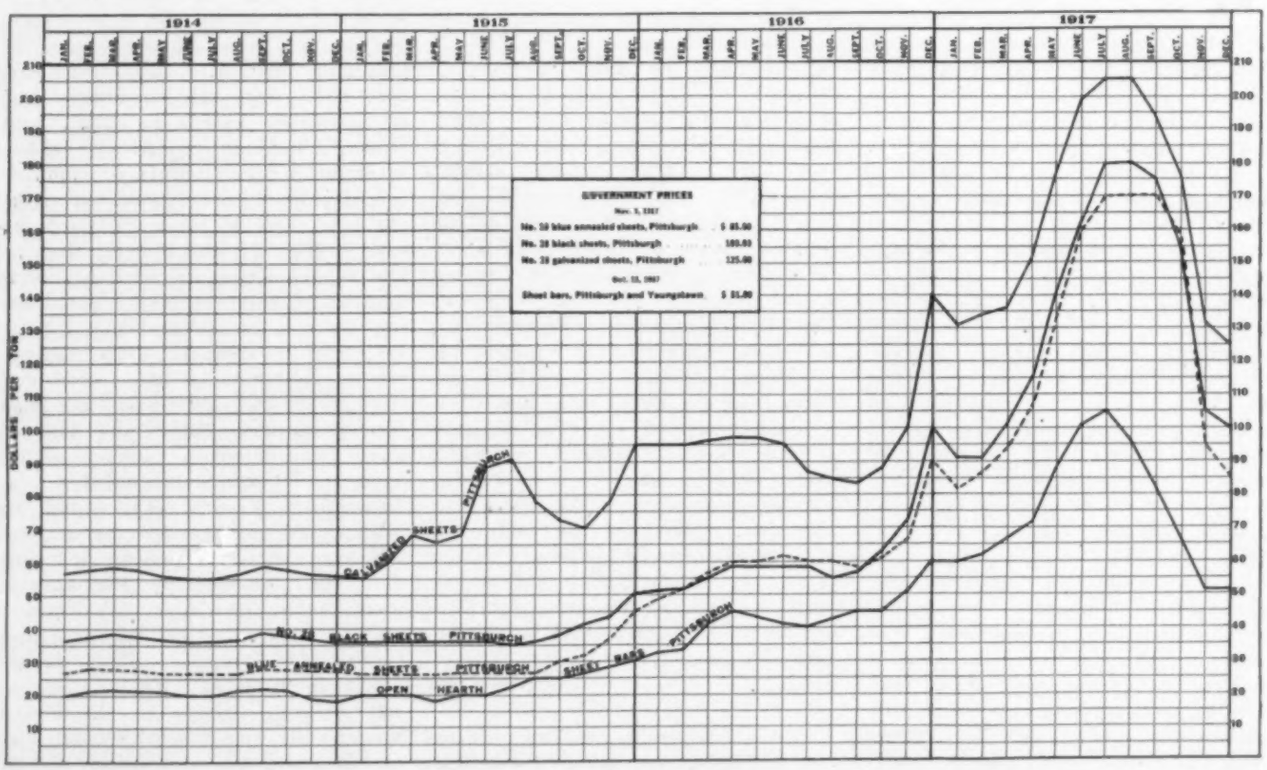


CHART OF AVERAGE MONTHLY PRICES OF SHEETS AND SHEET BARS, 1914-1917

and during the latter part of January only about 33 per cent of the galvanizing capacity and not more than 25 per cent of the galvanizing pots in the Pittsburgh district were in operation. Practically every manufacturer in that territory had enough tonnage to maintain the schedules then in effect to July 1, and there was no disposition to sell for delivery after that time. Inquiries began to come to all mills for military requirements, black sheets being wanted for helmets, and corrugated galvanized sheets for bomb-proofs. Fair-sized tonnages for these purposes went early to many of the producers, some of them in the Youngstown district. Lack of fuel and poor transportation almost forced mills to suspend in the Pittsburgh and valleys district and soon after makers began to drop out of the market temporarily. An advance from 4.69c to 8.94c in No. 28 black sheets between the beginning of the year and the fixing of prices by the government shows the trend of the market in the Chicago district. Prices on blue annealed and galvanized ran about parallel with black in that territory. A factor in the rapid advance and short supply of sheets in all sections was the inability to obtain sufficient sheet bars. By June, priority certificates came into use and sheetmakers used much caution in taking business unless genuine orders from the government were actually in hand. Tonnages were distributed by a sheet committee of the American Iron and Steel institute.

Before the end of June the situation in the Chicago district had reached the point where sheetmakers were unable to entertain inquiries from any consumer not engaged on government work. A better supply of sheet bars then enabled idle mills to be put into service and the total tonnage of sheets was increased so that later in the year, after prices had been fixed, it was possible to take on further domestic orders.

In the east the year opened with the market at 4 to 4.50c, Pittsburgh, or 4.159 to 4.659c for blue annealed No. 10. January witnessed heavy contract buying, especially by automobile and car manufacturers. Some of the business placed called for shipments through the third quarter. The eastern market reached its highest level in July, when No. 10 blue annealed commanded an average of 9.09c, Philadelphia, a figure which was maintained up to the last week in August.

Ship Tonnage by Express

Activity of the market in the Youngstown district was emphasized late in February, when heavy tonnages of sheets were shipped by express due to the anxiety of consumers who were affected by embargoes. Big tonnages of special grades of sheets were also sent by express to eastern centers and to Detroit automobile-makers. Late in March several million dollars worth of sheets were held up in stock, and in shipping rooms of mills in the Mahoning valley awaiting cars. Heavy tonnages of electrical sheets were taken by Pittsburgh mills, during March, for shipment to Europe, South America and the far East, premium prices being paid by foreign buyers.

The market began to decline late in August, due to reports that prices were to be fixed. The market dropped from the high levels reached in July to 6c and 6.50, Pittsburgh, in a short time.

Increased tonnages of sheets were moving by the second week in November and demand was much greater than offerings. The latter mostly were for delivery over the remainder of the year, although there were some for January delivery. Some of the mills virtually were out of the market, being well sold-up at figures higher than those set by the government.

It is probable that the sheet market was more active than any other finished line in November. An estimate was made that sales in that month by independents involved approximately 140,000 tons of various grades. The end of the year saw an extreme scarcity of tin mill black products.

Wages paid to tonnage men in the sheet mills in November and December averaged more than double the wages paid in the spring of 1915. Beginning then and almost till 1916, the wages paid were under the base rates in the scale, 11.2 per cent. September and October averages in 1917 were 85 per cent above the base, while wages for November and December were 96 per cent above. The November-December wages were $0.998 per 100 pounds on No. 28 gage, comparing with $0.945 for September-October, and $0.610 for January-February.

Cast Iron Pipe Breaks Price Record

CAST iron pipe makers had a fairly busy year in spite of high prices which greatly curtailed purchases by municipalities. Inasmuch as pig iron is the governing factor in pipe prices the vaulting range of cost of that material was very effective. It carried cast iron pipe to the highest point in its history. Toward the close of the year business for the pipe shops had dropped low and there was some closing of plants through lack of orders.

Six-inch class B pipe opened the year at Chicago at $41 per ton and at New York at $41.50. With the upward movement of pig iron these prices mounted in June to $65.50 in both these markets. This price held until in September when $33 was established by the government as the price for pig iron and within a fortnight a reduction of $15 per ton was made at Chicago, placing 6-inch pipe at $50.50. This reduction apparently was too severe and during the early part of November an advance of $5 was made to $55.50, Chicago. At New York a reduction of $9 was made in October and a further cut of $2 in November, bringing the quotation in that market to $54.50.

Throughout the year western cities refrained from buying more than actual pressing needs and tonnage to this class was much below normal. The government bought considerable tonnage for army cantonments at a special price. Pipe makers maintained an office in Washington for the distribution of government business and the total amount ran to fully 20,000 tons. The price first made to the government was $59 at northern and $55 at southern foundries. These figures later were reduced to $49 and $45. Industrial demand for pipe was excellent throughout the year and an especially large tonnage of special castings was booked. This class of work is profitable to pipe shops and made up for loss of business to cities. In the east where new industrial cities grew up under the spur of war manufacturing expansion, there was strong demand for pipe. Export business was large with France, Holland and South America, making up in considerable degree for the loss of tonnage in the west. The government inquired in November for 2900 tons for military use in France on which awards have not been made. Following the lead of other iron and steel manufacturers, a conference of leading pipe makers was held in Washington late in November to decide on prices to be recommended to the American Iron and Steel institute for subsequent announcement as the official prices.

Bars Swayed by Remarkable Events

Unprecedented Conditions Rob Market of All Normal Appearances and Dictate Distribution of Tonnage in Strange Fashion—Prices Skyrocket to Record Height and Drop Abruptly Under Government Regulation

EXTRAORDINARY conditions have dominated the bar market during 1917. No such combination of circumstances and events ever has confronted the iron and steel industry. War brought unusual problems and demands and the government took a hand in affairs in a way never before attempted. As in 1916, the industry in the United States was called on to supply the world in a large degree since other large producing nations were engaged in war and needed their entire output. Superimposed on this heavy world demand was the tremendous needs of the United States government for war purposes. Railroad congestion, shortage of equipment, difficulty in obtaining fuel for metallurgical operations and sudden expansion of industrial needs combined to make a condition that gave the steel industry a burden such as never before had been experienced.

Prices on bars ran a course through the year which can be likened most graphically to the path of a skyrocket. Not only was the rise most spectacular and to levels never before attained but the parallel was continued in the abrupt fall which came when prices were fixed by agreement in September. The latter brought about a vertical drop from a high altitude to a base level somewhat lower than that obtaining at the beginning of the year.

Delayed Tonnage is Heavy

At the opening of 1917 many large steelmakers had bar orders on books sufficient to cover their output through the entire year and others were able to give delivery no earlier than third quarter. Some smaller makers, who had avoided taking large contracts for remote delivery, were able through the year to take advantage of premium prices on spot material. Under these conditions, and with deliveries constantly deferred by government needs being put ahead of private contracts, selling to ordinary users was comparatively small. The year closes, however, with a large tonnage remaining on mill books which was contracted for delivery in 1917, but will not be shipped until well in 1918. Most producers have been giving every effort to filling government needs, both direct and indirect. At the same time the mills have used every endeavor to prevent acute shortage to regular customers, as far as has been possible under the stress of war demands.

In the shortage of soft steel bars, many consumers have turned to bar iron and hard steel bars as substitutes for such purposes as they could be used and this has relieved the tension somewhat. This increased demand has carried quotations on these products to unusually high levels and has destroyed in large measure the usual differentials relating them to soft steel.

At the beginning of the year steel bars were quoted in all markets at a minimum of approximately 3c, Pittsburgh, rising to a minimum of 4c, Pittsburgh, in August, an increase of $20 per ton. At this time the probability of prices being fixed by the government became a restraining influence and, as little selling was being done, the price did not exceed a minimum of 4.50c, Pittsburgh. On Sept. 24, the war industries board, by agreement with steelmakers, fixed a price of 2.90c, Pittsburgh and Chicago, which was adhered to until the close of the year. During the weeks when the higher range was in effect, some sales were made up to 6c, for prompt delivery. However, such business involved small tonnages.

Bar Iron Prices

BI-MONTHLY WAGE SETTLEMENTS SHOWING AVERAGE PRICES

	1913	1914	1915	1916	1917
Jan.-Feb.	1.4831c	1.1590c	1.024c	1.40c	2.35c
Mch.-Apr.	1.5434c	1.1760c	1.05c	1.60c	2.45c
May-June	1.5272c	1.1257c	1.10c	1.85c	2.65c
July-Aug.	1.5029c	1.0928c	1.15c	1.95c	2.75c
Sep.-Oct.	1.3931c	1.0847c	1.20c	2.00c	2.85c
Nov.-Dec.	1.2030c	1.037c	1.30c	2.15c	....

ANNUAL AVERAGE OF SETTLEMENT

1916	1.825c
1915	1.137c
1914	1.1843c
1913	1.4421c
1912	1.2645c
1911	1.2598c
1910	1.4423c
1909	1.360c
1908	1.386c
1907	1.627c
1906	1.587c

Demand Exceeds Mill Capacity

In all markets throughout the year demand for bars was enormous, far in excess of the ability of mills to fill. Conservative steelmakers deprecated the rapid rise in price and important interests which had sold for distant periods, maintained quotations far below the top. They could take business in limited tonnages only, however, and only from regular customers. Buyers bid the market up in the endeavor to get material while sellers for the most part would have preferred to have had quotations at a lower level. Through most of the last half important producers were out of the market.

Shortage of raw steel and more insistent demand for other products, notably steel plates for ship and car building and shell rounds, caused diversion of ingots to that purpose and limited the production of bars. Mills at no period in the year were free to offer bars and such selling as was done was to regular customers in great need. It was necessary to establish the existence of an emergency in almost every case where tonnage was booked.

Conditions caused some irregularity in prices early in the year, the east being at a higher level than the west. At the beginning of the year, Chicago and Pittsburgh sold tonnage at 3c, Pittsburgh, while in the east deliveries of 30 to 60 days went at 3.25c, Pittsburgh. Second quarter contracts were made in the east at 3.50c, Pittsburgh, in January, and at the same time some sales to agricultural implement makers were made at 2.90c, Pittsburgh. In March some implement bars were sold at 3.25c and second half contracts were made at 3c.

Prices Go to 6c, Mill

These sales were followed by advances making the eastern market 3.50c to 3.75c, Pittsburgh. At the same time the Chicago market advanced to a minimum of 3.50c and Pittsburgh quotations were about the same level. March and April saw the distribution of large shell round tonnages by the government and as other war needs loomed there was a cessation in selling. Contracting for fourth quarter at 4c, Pittsburgh, was done in the east in May, while a nominal quotation of 3.50c to 3.75c, Pittsburgh, persisted in the west, with practically no selling at that level. By the middle of June, the market reached 4.50c, Pittsburgh, in the east, and 4.75c, at Chicago. Shortage of supply at that time caused some selling at as high as

6c and bars rolled from shell discards were sold at 4.50c to 4.75c, eastern mill.

In June the government distributed about 80,000 tons of shell rounds at an agreed price of 3.75c, Pittsburgh. In September some mills booked considerable tonnages at 4c to 4.25c, Pittsburgh, for last and first quarter delivery. The leading interest in September booked large tonnages for larger custumers for first half of 1918 at 3.50c, Pittsburgh.

Concrete or hard bars ranged at about the same level as soft steel bars thoughout the year, but in the absence of a fixed price were at a higher level than soft steel from September to the close of the year. The quotation gradually receded after the fixing of the soft steel bar price until the spread was comparatively small.

Bar iron enjoyed a strong position throughout the year. Inability to obtain steel caused heavier demand for this product as a substitute. At the opening of the quotation was 3c, Chicago and eastern mill, while the Pittsburgh quotation was about 3.25c.

Advanced prices adopted late in 1916 on nuts, bolts and rivets were well established when business was taken early in 1917. Orders were greater than in the preceding year and demands throughout 1917 were unusually heavy. Prices fixed by the government on these products did not meet approval of manufacturers who claimed they were too low, as they could not obtain steel bars at the fixed price.

Heavy demands were made at the beginning of the year on hoop and band mills in the Pittsburgh district. The Carnegie Steel Co. in January quoted hoops at 3.50c and bands at 3c, Pittsburgh, delivery at its convenience. As high as 4.25c and 4c, respectively, was commanded for second quarter. In March, the market went to 4.50c for hoops and 4.35c for bands. In July, both sold at 6c, which ruled through October. Demand for hoops continued active throughout the year, but during the last quarter the band market was quiet.

Requirements offered makers of cold rolled shafting during 1917 were extremely heavy. The government took large tonnages. The end of the year saw mills from three to four months behind on deliveries. However, they were able to take tonnages in certain sizes from domestic buyers. Only limited lots have been sold at the fixed figure of 17 off.

Steel Pipe Makers Fall Far Behind

TREMENDOUS demands for tonnage were made upon makers of tubular goods in 1917. Oil and gas lines took heavy requirements and added to these were tonnages for military purposes, some for shipment abroad. Manufacturers of steel pipe became so heavily booked by the middle of the year that they were compelled to refuse business except that coming from the government and regular customers whose requirements were urgent.

The National Tube Co. at the close of the year was about 18 to 20 weeks behind on deliveries of butt weld pipe and from 58 to 65 weeks behind on shipments of lap weld pipe.

The soaring prices of 1916 were carried well through 1917. The highest price was 42 off list for ¼ to 3-inch pipe, Pittsburgh, a rise of seven points or $14 a ton over the preceding card issued May 1 by independents. The National Tube Co. did not make any advances of its own volition after issuing its 55 discount of April 2 and with the Republic Iron & Steel Co. increased prices only after the war industries board Nov. 6 established the basis for ¼ to 3-inch pipe at 52, 5 and 2½, subject to the regular trade allowance to jobbers. As a result of this, all makers Nov. 7 issued new cards of 51 off on black and 37½ on galvanized. The wrought pipe mills reaffirmed June 30 cards.

Three cards were in force at one time in the case of steel pipe. All adopted the 55 discount card of April 2, some issued a 49 discard card May 1 and a number of the latter put out the 42 discount card of June 25. All iron pipemakers maintained the same cards, issuing their 44 discount card April 2, their 38 discount card May 1 and their 33 discount card June 30.

Heavy demands were also made for boilers and seamless tubes. Steel boiler tubes ran away soon after the April 2 card of 34 off, 3½ to 4½ inches, less carloads, was issued and subsequently there was no recognized set of prices. The American Iron and Steel institute Nov. 14 announced agreed discounts on tubes which were 30 off on 3½ to 4½-inch less carloads for steel and 12½ off for iron. In the accompanying steel pipe price changes in 1917 the cards of 49 per cent, issued on May 1, and the 42 per cent list of June 25 are omitted, the discounts used being those of the National Tube Co.

Changes in Discounts of Standard Steel Pipe

Date	Sizes in inches	Butt Weld Basing Discount Black	Galv.
Jan. 1, 1910 to Oct. 1, 1910	¼ to 6	78	68
Oct. 1, 1910 to Oct. 2, 1911	2 to 3	80	70
Oct. 2, 1911 to Dec. 1, 1911	2 to 3	81	74
Dec. 1, 1911 to Dec. 15, 1911	2 to 3	83	76
Dec. 15, 1911 to Jan. 1, 1912	2 to 3	83	76
Jan. 1, 1912 to July 1, 1912	2 to 3	82	75
July 1, 1912 to July 24, 1912	2 to 3	82	75
July 24, 1912 to Sep. 10, 1912	2 to 3	81	74
Sep. 10, 1912 to Jan. 1, 1913	2 to 3	80	72
Jan. 1, 1913 to Apr. 12, 1913	¼ to 3	80	71½
Apr. 12, 1913 to May 27, 1913	¼ to 3	79½	71
May 27, 1913 to Aug. 8, 1913	¼ to 3	79	70½
Aug. 8, 1913 to Oct. 27, 1913	¼ to 3	80	71½
Oct. 27, 1913 to Feb. 2, 1914	¼ to 3	80	71½
Feb. 2, 1914 to Apr. 20, 1914	¼ to 3	79½	71
Apr. 20, 1914 to Nov. 2, 1914	¼ to 3	80	71½
Nov. 2, 1914 to Feb. 11, 1915	¼ to 3	82	72½
Feb. 11, 1915 to May 1, 1915	¼ to 3	80	69½
May 1, 1915 to June 1, 1915	¼ to 3	79	68½
June 1, 1915 to June 17, 1915	¼ to 3	79	63½
June 17, 1915 to Aug. 15, 1915	¼ to 3	79	57½
Aug. 15, 1915 to Nov. 1, 1915	¼ to 3	79	63½
Nov. 1, 1915 to Jan. 4, 1916	¼ to 3	78	63½
Jan. 4, 1916 to Jan. 20, 1916	¼ to 3	77	62½
Jan. 20, 1916 to Feb. 15, 1916	¼ to 3	76	60½
Feb. 15, 1916 to Feb. 29, 1916	¼ to 3	75	59½
Feb. 29, 1916 to Mar. 15, 1916	¼ to 3	74	57½
Mar. 15, 1916 to Mar. 29, 1916	¼ to 3	73	55½
Mar. 29, 1916 to Apr. 21, 1916	¼ to 3	72	53½
Apr. 21, 1916 to July 24, 1916	¼ to 3	70	50½
July 24, 1916 to Sept. 7, 1916	¼ to 3	70	55½
Sept. 7, 1916 to Nov. 1, 1916	¼ to 3	69	55½
Nov. 1, 1916 to Nov. 15, 1916	¼ to 3	69	55½
Nov. 15, 1916 to Dec. 4, 1916	¼ to 3	68	54½
Dec. 4, 1916 to Dec. 30, 1916	¼ to 3	66	52½
Dec. 30, 1916 to Feb. 14, 1917	¼ to 3	64	56½
Feb. 14, 1917 to Mar. 5, 1917	¼ to 3	62	48½
Mar. 5, 1917 to Apr. 2, 1917	¼ to 3	60	46½
Apr. 2, 1917 to Nov. 6, 1917	¼ to 3	55	41½
Nov. 6, 1917 to	¼ to 3	51	37½

Ships Sustain Structural Industry

Revolutionary Demand Upon Shape Mills and Fabricating Shops for Material for Marine Construction Compensates for Great Slump in Commercial Building Work—Government by Far, Becomes Chief Buyer of Market

PERHAPS the most revolutionary development in the steel industry during 1917 was the extensive application of structural shapes to the building of ships. When shipbuilding was taken in hand by the government, as the one of all instruments essential in winning the war, old-time methods and the supply of ship shapes were found utterly incapable of coping with the situation. To meet the emergency, structural mills and fabricating shops were called upon to furnish huge tonnages. The practicability of this departure already has been demonstrated thoroughly and indications are that the standardized, or fabricated, steel vessel permanently will be a portion of the field served by the structural industry. All through the year plain shapes were exceedingly difficult to obtain. As early as January some of the mills were sold up practically throughout 1917. Demand at that time, although not of the same staggering proportions as for plates, was far beyond the capacity of the mills to accommodate. During the second quarter, bookings had increased to such an extent that many of the mills withdrew entirely from the market and made no more sales during the year excepting to the government. The situation was aggravated by a great restriction in output; not only was the raw steel urgently required for the manufacture of other finished products, but high prices on ship shapes caused numerous structural mills to devote a large part of their capacity to rolling the latter. Other factors were car shortages, scarcity of labor and of fuel which forced the makers to run behind in their deliveries. In various parts of the year deliveries fell off to such an extent as to interfere seriously with the operations of fabricators.

The year was a most difficult one for the fabricators. Not only did the high prices on plain shapes effectually serve to reduce commercial structural work to a minimum but the continued difficulty in getting steel made it impossible in many cases for fabricators to secure from the mills the protection necessary to enable them to quote. Had it not been for the tremendous tonnage called for in connection with our war requirements many fabricating shops undoubtedly would have been idle over protracted periods, and particularly toward the end of the year. Commercial structural work was active during the first quarter but showed a constant decline, so that contracts for hotels, office buildings, apartment houses, auditoriums, churches and similar buildings were almost entirely lacking during the second half. By the end of September only 29 per cent of the entire bridge and structural capacity of the country was contracted for and this figure would have been much lower had it not been for the tonnages previously placed for all kinds of construction necessitated by our participation in the war. In November, after the placing of large tonnages of fabricated ship steel had commenced, this figure increased to 77 per cent and the outlook is that the compilation for December will show a further increase. The government was by far the biggest single buyer and its needs, direct or indirect, absorbed the greater portion of the shape mill and the bridge and structural shop output. In addition to fabricated ship steel, it placed huge tonnages for additions to arsenals and navy yards, for airplane hangars, portable buildings, magazines, a nitrating plant, store houses, and for a large amount of construction for our military purposes in France. In government requirements originated also a large demand for tonnage for the erection of buildings of all kinds to fill war needs. Large tonnages went into the construction of cars, locomotives, mines, etc. The biggest single requirements during the year were those of the Submarine Boat Corp. and the American International Shipbuilding Corp. As agents for the government these interests have placed or are about to place orders for ship steel which are large enough to engage the entire fabricating capacity of the country for more than three months. Large orders also were booked by the American Bridge Co. for the steel for ships to be built by its sister subsidiary, the Federal Shipbuilding Corp., as well as by the Chester Shipbuilding Co., the Merchant Shipbuilding Corp. and the Newburgh Shipyards. Huge tonnages of ship steel still are to be placed. At the beginning of the year the minimum price on plain shapes was 3.10c, Pittsburgh, for delivery at mill convenience, while as high as 3.75c was done on preferred deliveries. The market advanced steadily until the middle of the year, when 4.50c, Pittsburgh, was established as the highest average minimum, with preferred deliver-

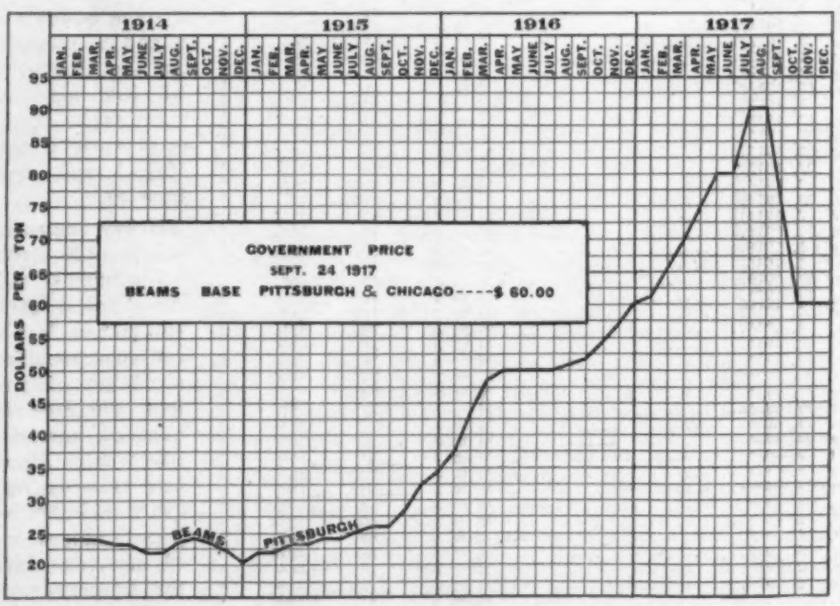

1914
1915
1916
1917
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
DOLLARS PER TON
95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20
GOVERNMENT PRICE
SEPT. 24 1917
BEAMS BASE PITTSBURGH & CHICAGO----$ 60.00
BEAMS
PITTSBURGH

CHART OF AVERAGE MONTHLY PRICES OF BEAMS 1914-1917

ies in some cases as high as 6c. A large eastern maker in fact managed to take on considerable third quarter tonnage at 6c. During the third quarter demand lagged. The high prices had scared off practically all commercial structural work. Furthermore, the fixing of prices under government regulation was foreseen, so that a disposition to postpone buying became general. Owing to the immense amount of tonnage on their books the lull was not unwelcome to most of the mills. On such new business as was placed, however, some of the makers granted concessions, so that just before the establishment of the government base of 3c, Pittsburgh and Chicago, on Sept. 24, the market minimum had declined to 3.75c, with preferred deliveries at 4.25c, and 4.50c, Pittsburgh. A few small mills continued to sell at prices varying from 3.75c to 4.50c, but these cases were exceptional. While all the principal makers recognized and adhered to the new government price, it at first was not quoted on anything excepting government tonnage. In fact, most of the makers continued out of the market through the rest of the year. Early in October shapes began to be offered commercially here and there at the new base and immediately there was a flurry in inquiry. Very little of this, comparatively, was closed. The custom generally adopted in quoting on domestic business on the new 3c base was to name a differential of 10 cents per 100 pounds for special sections and of 50 cents per 100 pounds for shipments out of stock. On export business the general policy continued to be to get the best prices possible.

Export Demand is Huge

Demand from abroad was of huge proportions during the first half, and it was customary for export inquiries to total 25,000 to 50,000 tons weekly. Export orders for structural shapes reached a heavy total during this period. The export embargo which became effective Aug. 15 included shapes and although shipments were made under licenses thereafter, the tonnage was reduced materially. Export demand for ship shapes especially was active during the first half and large orders were booked. Ship shapes also enjoyed a tremendous demand at home and commanded premiums over structural shapes. The highest prices prevailing on ship shapes for domestic sale developed in July, when 6c to 6.50c, Pittsburgh, was paid for large tonnages. For export to Japan ship shapes then were bringing in some cases as high as 8c.

Structural tonnage awarded monthly as compiled by the Bridge Builders and Structural society is as follows:

	1917	1916	1915	1914
Jan.	119,000	119,000	43,000	110,000
Feb.	106,000	129,000	51,000	105,000
March	122,000	175,500	110,000	130,000
April	110,000	125,000	107,500	150,000
May	102,000	137,000	150,000	100,000
June	85,500	100,000	138,000	95,000
July	74,700	83,600	148,000	115,000
Aug.	68,400	110,000	146,000	50,000
Sept.	52,200	99,000	115,000	65,000
Oct.	110,700	133,500	134,000	60,000
Nov.	138,600	134,000	180,000	35,999
Dec.	153,000*	148,000	208,000	60,000
Total	1,242,100	1,493,600	1,485,000	1,075,000

*Estimated.

Jobbers Besieged By Hungry Buyers

STEEL jobbers experienced a demand during 1917 that exceeded anything in the past and extended far beyond their ability to supply. With mills far behind on contracts and buyers unable to place their business as freely as usual, they turned naturally to store stocks to fill out where they were short. This demand was not confined to small tonnages. Buyers attempted at various times to obtain material in what ordinarily is regarded as mill lots. With this pressure from the consumer, the warehouses also found their own deliveries from mills considerably interfered with. The result of these two forces was to keep assortments ragged most of the year. It became necessary to limit sales in many instances to regular customers in need and to refuse inquiries from buyers who had not been steady patrons.

The usual margin of price above mill quotations was not observed during the greater part of the year and at times mills quoted prices higher than stores were receiving. This was due to the rapid increase in quotations arising from pressure of buyers seeking contracts at a time when most mills were not selling.

At the middle of the year the government placed heavy demands for material from warehouse to be shipped to navy yards, arsenals, etc.

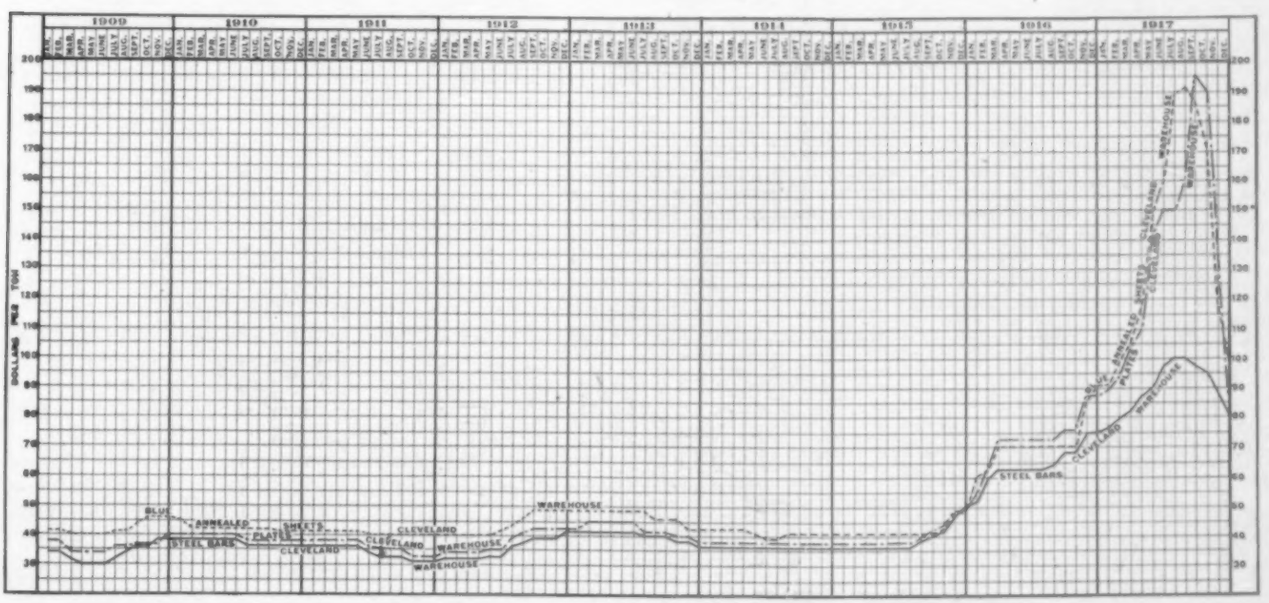


CHART OF AVERAGE MONTHLY PRICES ON LEADING WAREHOUSE PRODUCTS, CLEVELAND, 1909-1917

Scrap Claims New Place in Industry

Prices Are Bid Up to Unprecedented Levels Due to Tremendous Consumption and Shortage of Supply—Substituted Freely for Pig Iron—Traffic Conditions Constitute Effective Drag on Trade

IRON and steel scrap had its most interesting year in 1917. As much as $47.50 per gross ton was paid for heavy melting steel. This is not likely to be repeated in 1918. The past year will be remembered chiefly for its high prices compared with previous periods, which in all probability will remain the record for many years to come. A review of 1917 is interesting for the things that happened in it were superlative and yet they are bound to be forgotten except for the financial considerations involved when the time comes round for the coming year to be seen in retrospect. The two years really must be coupled together to give the true prospective. Conditions brought about by the war have made scrap so scarce in the year past that it has become a more general alternative of pig iron than ever before. Were it not for price regulation by the government, dealers are saying it is not too much to believe that the price probably would equal at least that of pig iron.

Scrap in 1918 promises to be gathered from every nook and corner of the country as it never was sought before. It will be demanded by furnaces, foundries and rolling mills on a scale not before contemplated. The scrap trade promises to pass, if it has not already passed, from being the Cinderella of the steel industry to a distinguished position among the other leading branches of the iron and steel industry. The only limiting factor in the demand for scrap in the latter part of the old year, and which likely will continue of great influence during the year to come, is transportation.

At the outset of the year, in fact, the first week in January, the scrap market in the Pittsburgh district registered sharp declines as the result of the peace offers of Germany. Prices slumped from $3 to $5 under those of the month preceding. Heavy melting dropped to $24, delivered. The market continued to decline and became extremely dull with heavy melting steel commanding $22 and other grades correspondingly weak. Railroad embargoes soon followed, limiting the territories in which scrap could be shipped and conditions were complicated further by the congestion of traffic. During the latter part of February the market had recuperated slightly, heavy melting steel selling at $24 in the eastern Ohio district, although consumers in the Pittsburgh district refused to pay more than $22 or $23. It was at this time that there went into effect the Canadian embargo against shipments of scrap from Canada. This compelled dealers in the United States to buy machine shop turnings and cast borings, previously obtained from Canada, in the open market. Prices

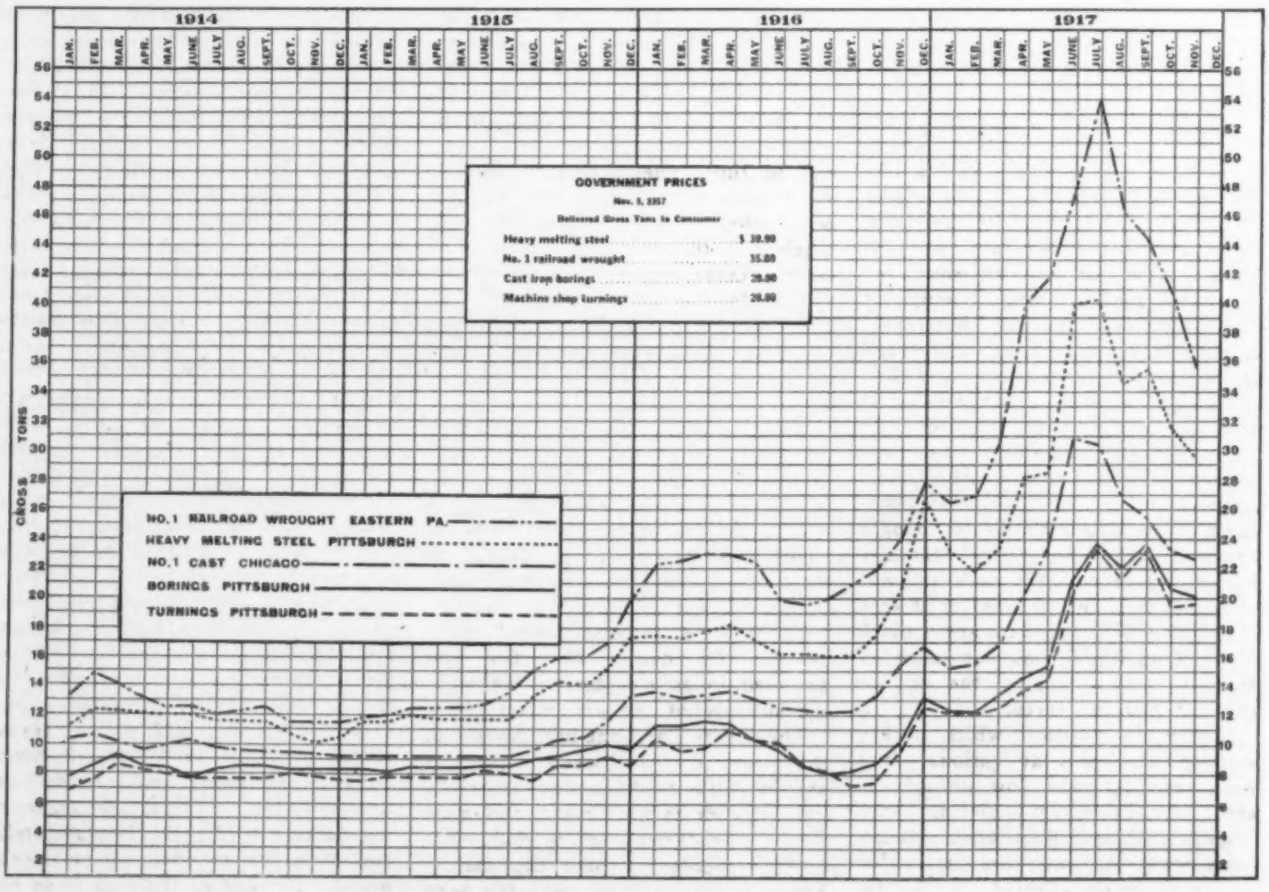


CHART OF AVERAGE MONTHLY PRICES ON LEADING GRADES OF SCRAP 1914-1917

began to harden henceforth. Heavy melting was quoted at $24, rerolling rails at $30, and low phosphorus at $35, with corresponding levels for other grades. Prices of scrap reached the highest points in 1917 that they ever attained. The highest average minimum prices were established in July, with heavy melting steel at $40.25, low phosphorus at $52.75 and No. 1 cast at $34.75, delivered. One of the interesting developments of the year in the trade was the meeting held in Pittsburgh in October by the American Board of Scrap Iron Dealers. Action was taken at that session looking to abatement of the car reconsignment and rejection evils through the creation of a bureau of inspection.

Prices in the scrap iron and steel market in the east as usual traced an erratic course. The general tendency, however, was strongly upward during the first six months and all previous records were shattered. During the third quarter the market reacted, due to the expectations of price-fixing, which materialized Nov. 6. The greatest buying movements were in April and June, when dealers in the Pittsburgh district came east for huge tonnages of heavy melting steel. In April the prices paid by Pittsburgh interests were equivalent to $25 to $26, delivered eastern Pennsylvania. The second largest buying movement started toward the end of May, with purchases around $29 to $29.50, eastern Pennsylvania, and before the movement ended toward the end of June, as high as $45, delivered Pittsburgh, or about $42 to $42.50, eastern Pennsylvania, was being paid. The third week in August there was another spurt, due to heavy melting steel buying by Pittsburgh, but this was short-lived; on the latter movement, Pittsburgh dealers paid between $35 and $37, Pittsburgh. These movements naturally caused a lot of steel scrap to move to Pittsburgh from New York state and New England, which normally would go to eastern Pennsylvania. The largest single lot bought by an eastern Pennsylvania consumer was 25,000 tons. One such lot was bought about the middle of March at $24.50 to $25, delivered, and a block of 15,000 to 20,000 tons was taken by another eastern mill at the end of June at $40, delivered.

Among the grades in which marked scarcity developed at various times were rerolling rails, low phosphorus and wrought scrap. During July, August and September, small transactions were the rule, the market at that time being affected by the expectation of price-fixing. The only grades which were sold liberally were wrought scrap; this was due partly to the fact that prices on bar iron had not yet been adjusted. By the time prices were fixed on Nov. 6, quotations in the east had sagged off to such an extent that the only figure which needed revision downward was No. 1 railroad wrought. This grade always is at a premium in the east as compared with the west and it was necessary that it be reduced several dollars in order to accord with the government figure of $35, delivered.

Fluctuation of Prices

The course of iron and steel scrap in the Chicago district has been a succession of unusual advances, and some small recessions, with the quotations at the end of the year much below the high point and not as far above the figure prevailing at the beginning of the year as had been expected. Heavy melting steel sold at an average price of $20.25 during January, and advanced steadily to a maximum of $40 in June, when a decline took place. This drop continued steadily until November when $26 was reached. At this time the government maximum price of $30 was fixed, but heavy melting steel remained slightly under that figure and did not reach higher than $29 at the end of November. Rerolling rails began the year at $28 and declined during January and February to $25, then started an upward movement which went forward until the end of June, when $50 was reached. A decline then started in common with other grades until $35.50 was reached at the end of October, after which fluctuations were slow. There was a decided shortage of rerolling rails throughout the year, and in the absence of a fixed price buyers refrained from taking more tonnage than was sufficient to cover their commitments of hard steel bars. Most of these users closed the year with comparatively small stocks. Car wheels rose from $20 in January to $40 at the end of June, and then declined with other scrap to $24.50 at the end of October. During November, when the shortage of pig iron developed, an increase began which reached $29 during November and promised to go considerably higher as the shortage of pig iron increased.

The first five and one-half months of the year in the Cleveland market showed little liveliness; no especially important deals were made, and most of the period was rather dull. But in the middle of June the market began to liven up in sympathy with Pittsburgh and other trade centers. When the high mark was reached early in July sales of heavy melting steel had been made at as high as $45 a gross ton. About the middle of July the market began to weaken, and gradually fell into the doldrums. Practically only routine sales involving small tonnages took place during the rest of the year. A little activity out of the ordinary appeared about the middle of September, but until well into November, when the market quickened, trading was colorless.

Buffalo is reputed to have taken considerable business away from northern Ohio at times during the year. Several purchases involving heavy tonnages of heavy melting steel were made by large Cleveland interests. The Buffalo market had the liveliest year in its history. Its response to new buying movements and undercurrents was quick. It was one of the first districts to feel the scrap shortage due to the scarcity of iron.

High tide conditions both as to demand and prices were experienced by dealers in the south during only a few months of the year, although the close of 1917 finds the market in good conditions as compared with the past two or three years. The government schedule of prices fixed a basis considerably in excess of what was actually being received in southern territory. Despite the fact that there were times when the southern scrap market was very active, prices never approached those of other districts. This was due to the difference in grading pursued in that section. Stocks until late in the year were available in great volume. Heavy melting steel in the middle of December was quoted at from $8 to $9 below the government maximum.

An unprecedented demand for every variety of scrap that could be melted or reheated prevailed at St. Louis, and intensive collection combed bare the usual sources of supply. In the closing months the country was sending forward only scant shipments and railroad lists had dwindled until during certain weeks their attenuation reached the point almost of invisibility. A certain element in the trade, and quite a formidable one, was overventuresome early in the year, and spurred by the very high prices sought swift profits by selling the market short. They have had cause since to repent their course, and a large part of profits accruing in bona fide transactions has gone to charge off losses on short contracts. Railroad congestion has been an important determining factor in the St. Louis district and threatens to continue so indefinitely. The end of the year finds the market in a favorable buying position.

New Liberty Mill Now Makes Plates

Mill Built in Record Time to Serve the Nation—Entirely Electrically Driven—Power Obtained from Carrie Furnace Power House—All Subsidiary Machinery Housed in a Special Building

BY R. B. WOODWORTH

THE construction of the 110-inch Liberty plate mill by the Homestead steel works of the Carnegie Steel Co. in six months is an engineering achievement which justly deserves mention even at this present time of rapid construction of buildings for emergency uses.

The Liberty mill is an emergency mill built in the first instance to roll ship plates for boats under construction for the Emergency Fleet corporation, but it has been built in the most substantial way to serve the nation when the war is done. A mill of this size had not been under consideration at Homestead steel works when the order to build the mill was received. There were no spare parts which could be taken from other mills, no engines, no machinery available. No pencil had ever been put to paper in the way of preliminary estimates or designs.

Constructing this mill required the removal of 70,000 tons of scrap and miscellaneous material on the site (2400 carloads), 71,980 cubic yards of excavation, 50,120 cubic yards of back fill, 17,147 cubic yards of concrete, the laying, changing and removal of 40 miles of temporary track, the construction of a 5-foot sewer 1000 feet long; it required the construction of an annex to the Carrie furnaces power house, the addition having a new 46 x 66 twin tandem gas engine direct-connected to a new 3750 kilovolt-ampere generator built by the General Electric Co., Schenectady, N. Y.; the building of a transmission line 2 miles long across the Monongahela river on two towers 115 feet high and 1007-foot span; the building of seven mill buildings with a total area of 215,000 square feet; the manufacture, fabrication and erection of 3390 tons of structural steel, together with the heating furnaces, rolling mill, 4000-horsepower main motor, subsidiary motors, straightening rolls, shears, cranes, etc., necessary for the operation of the mill itself.

Whipping the Kaiser

NO SINGLE enemy is more deadly to the submarine than the plate mill. Today, the more plates we produce, the greater the number of ships on the waves and the smaller the Kaiser's chances of a successful campaign of frightfulness. As the output of plates grows, the submarine problem shrivels. This was the thought that spurred the superintendents, office men, draftsmen, etc, of the Carnegie Steel Co., Homestead, Pa., to pitch in with pick and shovel to help get their new Liberty mill in commission in the quickest possible time. The important mechanical features of this truly American mill are presented in this article.

The mill was built by men whose hands were already full; men whose works were operated to capacity with unusual difficulties at an unprecedented time; men whose minds were occupied with the problem of insufficient coal supply, scarce and inefficient labor and transportation difficulties. Ordinary labor was practically unobtainable; in consequence steam shovels and machine tool methods were used. Orders were received to build the mill on April 17, 1917, but it was six weeks after that date before it was possible to secure sufficient laborers.

Volunteer labor saved the day. Officials and clerks from various Homestead steel works offices, both gen-

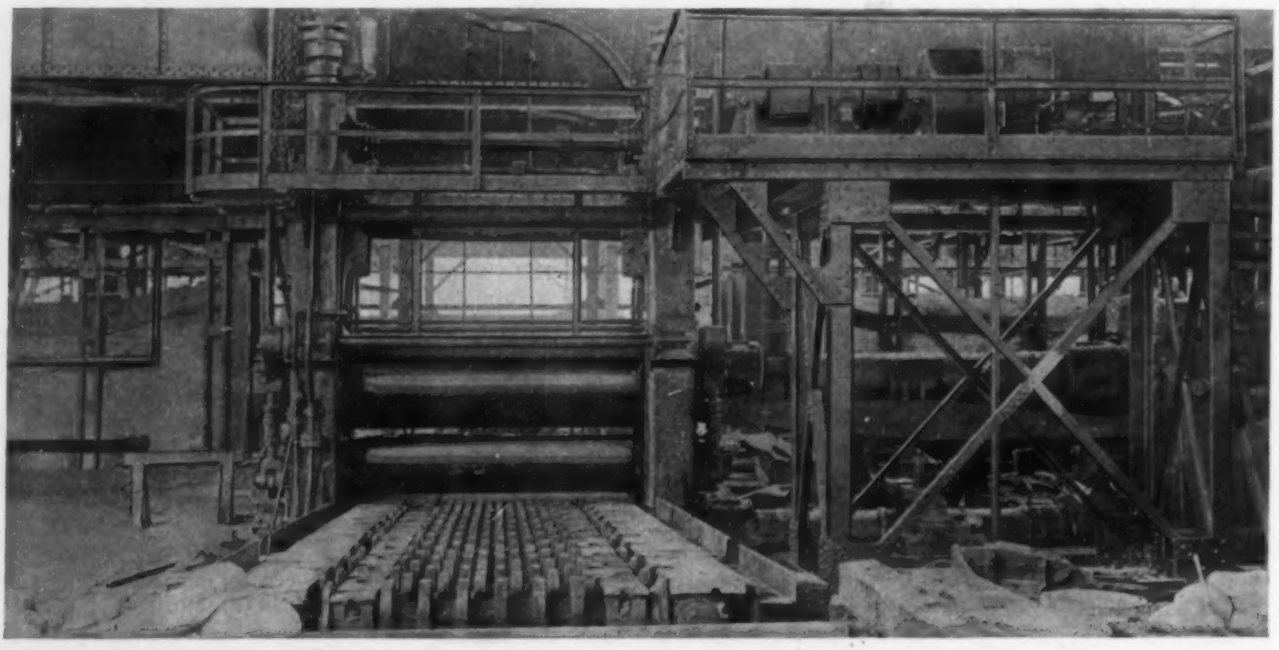


FIG. 1—FRONT VIEW OF THE 110-INCH LIBERTY PLATE MILL OF THE CARNEGIE STEEL CO., HOMESTEAD, PA.

eral and departmental, officials and clerks from the general offices, Pittsburgh, Homestead steel works department heads, mechanics of all trades, skilled and semiskilled mill workmen were represented in the forces which on Saturday afternoon, Saturday night and Sunday cleared up the stagnation which had accumulated during the week on account of the shortage of regular laborers. At one time as many as 450 volunteer workmen were on the job.

Organization Highly Skilled

The work was carried forward under the supervision of A. A. Corey Jr., general superintendent, Homestead steel works; R. H. Watson, assistant general superintendent, and J. W. McGrady, manager, producing departments. Daily conferences were held at the site at 7:30 a. m., and each division of the organization had the direct oversight, including the design and purchase of machinery, of that portion of the new plant which it was finally to operate. The chief civil engineer, F. B. Schaeffer, was responsible for the grading of the site, laying of foundations, sewers, underground work, equipment, back fill, railway tracks, etc. The design of the mill buildings and the general mechanical engineering work was in the hands of A. W. Soderberg, chief mechanical engineer. Cranes, motors and all electrical equipment came under the chief electrician, C. A. Menk. The master mechanic, Richard Moon, had the supervision of the mill machinery, pumps, etc. Charles S. Frye was superintendent of construction, and Kenneth Lean superintendent of transportation and labor. James Horton, efficiency engineer, acted as special ambassador to the various contracting firms building mill equipment. Each department worked out its own problems.

The 110-inch plate mill and its tracks cover an area of 9 acres on the Monongahela river west of the Howard axle works in West Homestead. On this site, April 17, were 70,000 tons of scrap and miscellaneous material or 2400 carloads. Thirty thousand tons of scrap, 2000 tons of loam, 700 tons of black clay and odd lots of sand, gravel, chrome ore, etc., had to be moved before the first pick could be sunk, and the first pick was a 73-ton, 2½-cubic yard steam shovel borrowed from the Union railroad.

Sinking the Foundations

The site was an old river bottom of mixed materials, part of it on cinder fill and all of a treacherous character. At the east end the soil was composed of old ashes and dirt which had been there for a number of years and which had to be removed with a steam shovel. One hundred and ten 40-foot piles had to be driven in the main foundation for the mill and mill motor and to support heavy machinery. The west end was composed of hot slag fill 10 to 15 feet deep which made a perfect foundation.

Foundations and Main Sewers

All the foundations are concrete, continuous for the brick buildings and of the single pier type for the main mill building columns. It is customary in the case of the latter to sink individual pits in which concrete forms are placed for pouring. Owing to the scarcity of labor, excavating, except small trenches, was done with the one 2½-yard shovel already mentioned, assisted by two ¾-yard and one 1½-yard shovels. The entire line of column foundations was excavated the whole width and length with the shovels, the piers built and the material back-filled. The main sewer is 5 feet in diameter, made of precast, reinforced concrete pipe. It is 1000 feet long, laid in a trench 30

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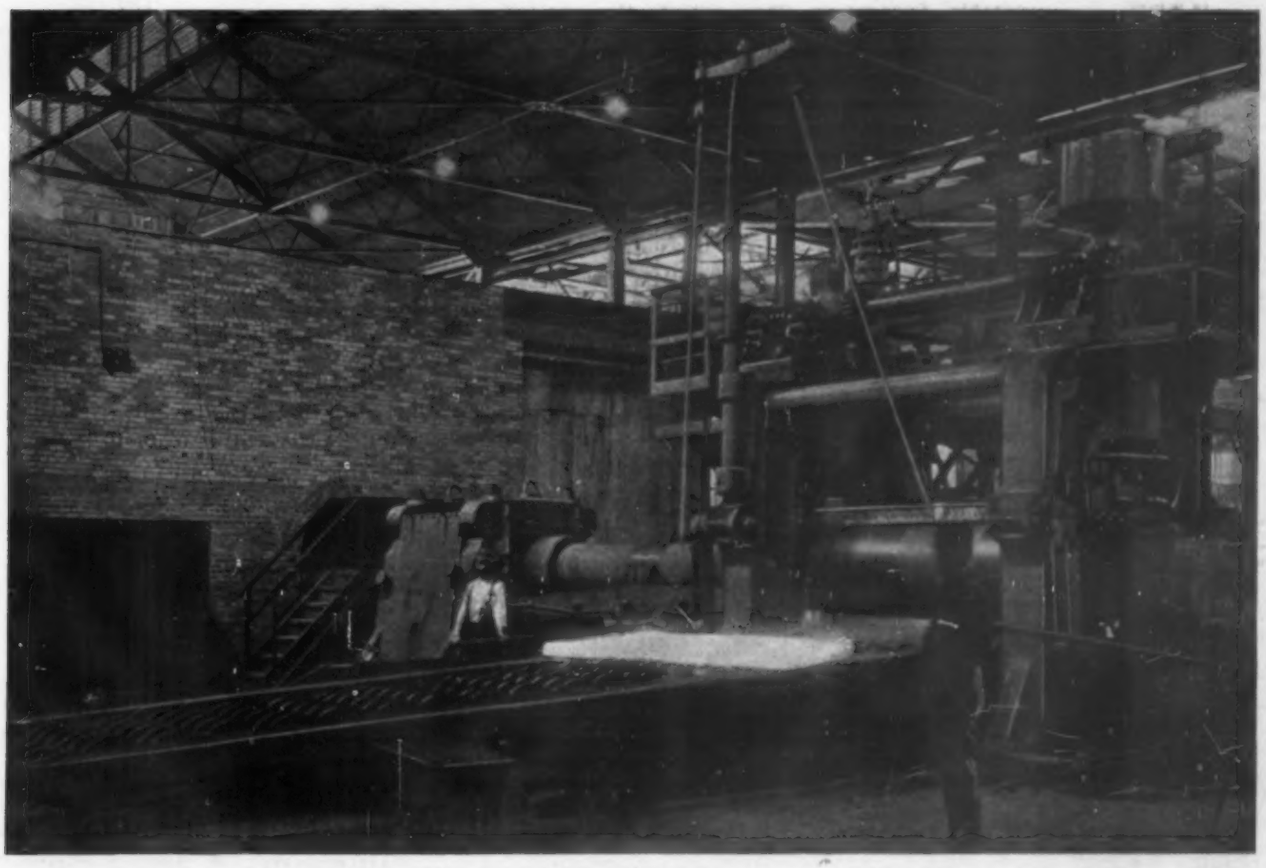


FIG. 2—SIDE VIEW OF THE 110-INCH MILL SHOWING A SLAB APPROACHING THE ROLLS

Roll of Honor

MUCH emphasis has been laid on the surmounting importance from a material standpoint of the American iron and steel industry in the present war. The latter, in fact, is the veritable foundation upon which the nation's great effort as a belligerent is being marshalled. Its strength as the right arm of the country's inherent forces, however, is no more notable than the zeal of its patriotic manpower.

Today many iron and steel men are occupying, with distinction, posts of great responsibility in welding the nation's resources into a gigantic war machine. While they are directing the forces behind the line, a great army of men of the office, mill or furnace, are carrying the colors of the industry to the front. On land and sea, wherever the flag flies, they are fulfilling the obligations of loyal and true citizenship. Many of them are in the service as volunteers.

The complete military roll of the iron and steel industry will run into the thousands. The largest organization has unfurled a service flag of 11,490 names. Various single plants have as many as 300 or 400 men enrolled. To publish the names of those of all ranks now in the service manifestly is impossible. THE IRON TRADE REVIEW has been obliged to limit this roll of honor to those filling official or representative capacities with blast furnaces, steel works or rolling mills.

THE ALABAMA CO., Birmingham, Ala.

J. F. Gillem	Asst. Sales Mgr.	Captain	Officers' Reserve Corps
R. W. Leonard	Secretary to Treas.		Aviation Corps
A. S. McElroy	Cashier	Sergeant	Draft Army

AMERICAN ROLLING MILL CO., Middletown, O.

Neuman Ebersole	Asst. Pur. Agt.	Ambulance Driver	Med. Corps
Alan G. Goldsmith	Sales Dept.	Captain	329th Infantry
Sidney E. Graeff	Sales Dept.	Ambulance Driver	Med. Corps
A. P. Preyer	Sales Dept.	Ambulance Driver	Med. Corps
Horace W. Rinearson	Sales Dept.	Ambulance Driver	Med. Corps
Foster E. Wortley	Sales Dept.	Lieutenant	Ordnance

AMERICAN STEEL FOUNDRIES, Chicago

F. H. Bird	Engineer	1st Lieutenant	Ordnance Dept.
J. H. Dore	Claim Dept.	Major	342nd Infantry
J. O. Eddy	Sales Agent	Ensign	Naval Reserves
W. C. Hedgcock	Brake Beam Dept.	1st Lieutenant	Ordnance Dept.
F. M. Hickernell	Sales Dept.	1st Lieutenant	Ordnance Dept.
L. J. Paddock	Sales Dept.	2nd Lieutenant	Artillery
H. R. Potter	Inspector	1st Lieutenant	Infantry
J. G. Russell	Inspector		Royal Flying Corps
M. W. Smith	Engineer	Captain	Engineers Corps

AMERICAN STEEL & WIRE COMPANY.

R. Mattice	Sales Agent	Captain	
H. S. Durant	Sales Agent	Major	Cantonm't Div.
F. H. Taylor	Salesman	1st Lieutenant	Artillery
F. Baackes, Jr.	Asst. Mgr., Manufacturers Dept.	1st Lieutenant	33rd Division
F. A. Pattison	Cashier	1st Lieutenant	Ordnance Dept.

Roll of Honor

ATLANTIC STEEL CO., Atlanta, Ga.

John P. Sutton	Chief Inspector	2nd Lieutenant	Coast Artillery
Marcus P. Lawton	Efficiency Engineer	Training Camp	23rd Cavalry
Walter M. Robinson	Office Staff	2nd Lieutenant	Field Artillery

THE BRIER HILL STEEL CO., Youngstown, O.

W. C. Troescher	Traffic Dept.	Corporal	332nd Infantry
Robert Hamilton	Pur. Dept.	Sergeant	136th Machine Gun Battalion
Fred E. Werner	Cost Dept.	Sergeant Major	331st Infantry
William G. Clark	Advertising Dept.	Colonel's Staff	
Robert C. Barton	Traffic Dept.	1st Lieutenant	Ordnance Dept.
Edward Oarty	Invoice Dept.	Corporal	331st Infantry
Mose Wall	Purchasing Dept.	Sergeant	135th Mach. Gun Battalion
John Stambaugh	Sales Dept.	Captain	136th Field Artillery

A. M. BYERS CO., Pittsburgh

Stephan D. Oliphant	Foreman	Sergeant	323rd Regiment
Chas. Morrow	Salesman	Captain	Aviation Corps
M. J. Cezarneckie	Salesman	1st Lieutenant	Aviation Corps
Harold W. Murphy	Foreman	Sergeant	316th Infantry
Roy Copeland	Foreman	Private	Aviation Corps
Harry G. Ripple	Paymaster	Private	331st Regiment
John W. Kress	Office Staff	2nd Lieutenant	Field Artillery
James W. Marrinan	Office Staff	2nd Lieutenant	Field Artillery

CARBON STEEL CO., Pittsburgh.

Jos. H. Holmes	Director	Captain	Reserve Corps
Holland S. Duell	Director	Captain	Reserve Corps
Charles McKnight Jr.	Metallurgist	Lieutenant	Infantry School of Arms
Harry S. Finkenstadt	Sales Agent	Lieutenant	U. S. Flying Corps
David B. Carson	Sales Agent	Lieutenant	Ordnance Dept.
Charles F. Wilson	Washington Rep.	Captain	Quartermasters Dept.
Richard J. McGovern	Purchasing Dept.	Corporal	Engineering Corps

CARNEGIE STEEL CO., Clairton Works

Lewis E. Anderson	Civil Engineer	Junior Engineer	15th Engineers
F. W. Sterling	Metallurgist	Lieut. Commander	Army & Navy Dept.

THE CARPENTER STEEL CO., Reading, Pa.

Wm. D. O'Gorman	Secretary	1st Lieutenant	Signal Corps
R. V. Mann	Foreman	1st Lieutenant	Ordnance Supply Division
George Luerssen	Foreman	2nd Lieutenant	Infantry

CENTRAL TUBE CO., Pittsburgh

Alexander Laughlin Jr.	Vice President	Captain	13th Infantry
Porter L. Laughlin	Asst. to Gen. Mgr.	Corporal	320th Infantry

COHOES ROLLING MILL CO., Cohoes, N. Y.

John W. Cooper	Cost Accountant	Corporal	303rd Infantry

COLORADO FUEL & IRON CO., Denver, Colo.

W. E. Madden	Salesman	Lieutenant	Navy
H. R. Tompkins	Salesman	Captain	Field Artillery
S. H. Potter	Superintendent	Captain	Ordnance Dept.

Roll of Honor

CRUCIBLE STEEL CO. OF AMERICA, Crescent Works, Pittsburgh

Henry C. McDonald.	Dept. Supt.	2nd Lieutenant	35th Ordnance
Clyde A. Trotter	Engineering Dept.	Corporal	319th Infantry
Wm. Symonds	Dept. Supt.		National Guard
James Brennan	Chief Engineer	Captain	7th Division Infantry

CURTIN FORGE CO., Curtin, Pa.

H. Laird Curtain	V. Pres. and G. Mgr.	Captain	1st Pa. Cavalry

DANVILLE STRUCTURAL TUBING CO., Danville, Pa.

Carleton Wagner	President		Signal Corps

DELAWARE RIVER STEEL CO., Chester, Pa.

Robert H. McCurdy	Secretary	1st Lieutenant	310th Field Artillery

HESS STEEL CORP., Baltimore

H. E. McCormick	Sales Representative.	1st Lieutenant	
J. B. Melick	Engineer	1st Lieutenant	

LACKAWANNA STEEL CO., Buffalo

Leo W. Hesselman	Comptroller	Lieut. Commander	Naval Militia
Nelson M. Oring	Supt. Shops	Major	Ordnance Dept.

LAKE ERIE IRON CO., Cleveland

Warwick J. Hayes	Asst. Supt.	Lieutenant	135th Field Artillery
Frank Hilfer	Production Supt.	Private	135th Field Artillery
Howard McDonald	Supt's Office	Corporal	331st Infantry

LALANCE & GROSJEAN MFG. CO., New York

August J. Cordier	Asst. Treasurer	2nd Lieutenant	305th Infantry

LIBERTY STEEL CO., Warren, O.

Richard A. Kenworthy	Sec. and Gen. Mgr.	Sergeant	Div. Train 308
John Willard Ford	Director	Lieutenant	Aircraft Board

LOCKHART IRON & STEEL CO.

T. J. Gillespie Jr.	Asst. Treasurer	2nd Lieutenant	37th Infantry

LOW MOOR IRON CO., Low Moor, Va.

George K. Anderson Jr.	Supt. Mines	Sergeant	Ordnance Dept.

MISSISSIPPI VALLEY IRON CO., St. Louis

E. Field Goltra Jr.	Supt. Blast Furnace.	Ensign	Navy
Robert A. Bagnell	Asst. Supt. Blast Furnace	Seaman	Navy
Herman Hannibal	Night Supt. Blast Furnace	Lieutenant	Officers' Reserve Corps

MONONGAHELA IRON & STEEL CO., Pittsburgh.

R. A. Carter Jr.	Manager	Private	320th Infantry

NICETOWN PLATE WASHER CO., Philadelphia

Wheeler Lord	Proprietor	Major,	Ordnance Dept.

ROGERS-BROWN IRON CO., Buffalo

Harold T. Clement	Asst. Treasurer	Lieutenant	27th Division
William S. Rogers	Asst. to President	1st Lieutenant	Field Artillery

SHARON STEEL HOOP COMPANY, Sharon, Pa.

Arthur S. Booth	District Sales Mgr.	2nd Lieutenant	American Expeditionary Force

Roll of Honor

SENECA WIRE & MFG. CO., Fostoria, O.

A. J. Welly	Director	Sergeant	Quartermaster Dept.

THE SHENANGO FURNACE CO., Pittsburgh.

Doyle H. Bugher	Office Staff	Corporal Corporal Eng. Corps.	15th U. S. Engineers

STRUTHERS FURNACE CO., Struthers, O.

E. Wheelock Jahn	Asst. Engineer		107th Field Artillery

THE STANLEY WORKS, New Britain, Conn.

Rodman Chamberlain	Purchasing Agt.	2nd Lieutenant	102nd Regiment Co. E
Cedric Powers	Mech. Supt.	1st Lieutenant	Engineering Corps
Richard Pritchard	Mgr. Cost Dept.		Watertown Arsenal
A. J. Griffin	Foreman	1st Lieutenant	
H. B. Hinman	Asst. Supt. Dept.	2nd Lieutenant	Depot Brigade

TRUMBULL STEEL CO., Warren, O.

C. K. Clark	Chief Draftsman	1st Lieutenant	Aviation Corps
C. E. Tousley	Mgr. Service Dept.	1st Lieutenant	Infantry
Herbert Hudnut	Office Staff	2nd Lieutenant	Infantry
Paul Wick	Asst. Sales Mgr.	Seaman	Navy

TYLER TUBE & PIPE CO., Washington, Pa.

Eugene Tyler Davis	Secretary	2nd Lieutenant	Signal Reserve Corps

UNITED IRON & STEEL CO., West Middlesex, Pa.

J. Ronald Wyllie	Asst. Superintendent	Lieutenant	Artillery

U. S. STEEL CORPORATION, New York

Raynal C. Bolling	General Solicitor	Colonel	Air Service

THE WELLSTON IRON FURNACE CO., Jackson, O.

Morris Lee Stephenson	President	2nd Lieutenant	134th Field Artillery

WEST LEECHBURG STEEL CO., West Leechburg, Pa.

Charles A. Todd	Asst. Manager	1st Lieutenant	Ordnance Dept.
M. W. Leech	District Sales Mgr.	Lieutenant	Aviation Corps
Raymond Kuhn	District Sales Mgr.	Lieutenant	Aviation Corps
H. L. Myers	Auditor	Sergeant	110th Infantry
Willard G. McFadden	Accountant	Battalion Sergeant Major	320th Infantry
John R. Alexander	Credit Manager	Sergeant	1st Field Artillery

WHITAKER-GLESSNER CO., Wheeling, W. Va.

W. W. Holloway	Asst. to President	1st Lieutenant	Ordnance Dept.
N. J. Ewing	Safety Director	1st Lieutenant	Ordnance Dept.
R. T. Crawford	Chief Engineer	1st Lieutenant	Engineering Corps
W. M. McCleary	Sales Department	Captain	Ordnance Dept.

WOODSTOCK OPERATING CORP., Woodstock Furnace, Anniston, Ala.

Frank G. Currington	Asst. Supt.	Corporal	17th Engineers

F. W. WURSTER & CO., INC., Brooklyn, N. Y.

F. W. Wurster	Pres. and Treas.	1st Lieutenant	105th Machine Gun Battalion

THE YOUNGSTOWN SHEET & TUBE CO., YOUNGSTOWN, O.

Louis J. Campbell	Vice President	Major	Artillery
S. C. Kneass	Steam Engineer	Sergeant	332nd Infantry

Fixed Prices Reaffirmed

Official Action Taken Extending Present Schedule to April 1—Contracts Beyond That Date Must be Subject to Revision

Washington, Dec. 29.—Official determination that the fixed prices on iron and steel products which are subject to revision or reaffirmation Jan. 1, 1918, has been made by President Wilson. This is in line with recommendations previously put up to the President by the war industries board. An important feature of the President's announcement is that no new contracts are to be made for delivery after March 31 at a specified price unless they contain a clause making the price subject to revision by the authorized government agencies. This ruling is aimed to keep all deliveries after March 31 from exceeding the maximum price then in force, although this material may have been ordered or contracted for during the next three months. This clause is to have no effect on contracts that are in existence at the present time and under which deliveries may extend beyond March 31.

Many contracts especially in pig iron recently have been made for shipment beyond March 31, and quite a number for the third and fourth quarters of 1918 in which it is provided that the contract prices which are at the fixed government level shall not be subject to any subsequent revision of the government schedule of prices.

Errors in Scrap Prices

Several typographical errors appeared in the statement of iron and scrap differentials which were published in the Dec. 27 issue of THE IRON TRADE REVIEW as a part of the additional prices announced by the general committee of the American Iron and Steel institute. The differential over heavy melting steel, on steel rails 56 pounds and heavier for rerolling purposes is $5 per gross ton instead of $3, as published. The differential for guaranteed low phosphorus scrap over heavy melting steel is $10 per ton instead of $19 per gross ton as given, and that for nonguaranteed low phosphorus scrap $5 per gross ton over heavy melting steel instead of $3 as stated.

Structural Awards Few

Quietness prevails in the structural steel market at the year's end. Among the pending projects are: Machine shop for E. W. Bliss Co., Brooklyn, 5500 tons; Grand Central viaduct, New York, 1100 tons; several bridges for the Lehigh Valley railroad, 500 tons; boiler house for the Potomac Electric Power Co., Washington, 400 tons; Chronic Hospital, Brooklyn, 250 tons; and bank at Titusville, Pa., 200 tons.

Contracts placed during the week include: Cleveland municipal electric light plant, 900 tons, to Republic Structural Iron Works; building addition for the West Virginia Pulp & Paper Co., 500 tons, to American Bridge Co.; bridge for the Chesapeake & Ohio railroad, 150 tons, to American Bridge Co.; signal bridges for the Chicago, Burlington & Quincy railroad, 225 tons; Mare Island navy yard, 150 tons, to local contractors.

To Build War Plant

Work is to be started on an extension to the plant of the National Tube Co., McKeesport, Pa., which will be devoted to the manufacture of war material. Originally it was proposed to build a plant for the manufacture of large pipe which had been produced heretofore only in Germany, but the war has altered these plans. The addition to capacity will be so laid out that it subsequently can be co-ordinated with the present mills to produce for commercial purposes.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products January 2, average for December 1917, average for October 1917, and average for January, 1917. Prices are those ruling in the largest percentage of sales at the dates named

	Prices Jan. 2, 1918.	Average prices Dec., 1917.	Oct., 1917.	Jan., 1917.
Bessemer pig iron, Pittsburgh..	$37.25	$37.25	$37.25	$35.95
Basic pig iron, Pittsburgh.....	33.95	33.95	33.95	30.95
*No. 2 Foundry pig iron, Pitts.	33.95	33.95	33.95	31.95
*No. 2 Foundry pig iron, Chic.	33.00	33.00	33.00	30.00
Lake Superior Charcoal, Chicago	37.50	37.50	48.50	33.75
Malleable, Chicago	33.50	33.50	33.35	30.00
**Southern, No. 2, Birmingham.	33.50	33.50	33.00	23.00
*Southern Ohio No. 2, Ironton.	33.00	33.00	33.00	30.00
Basic, eastern Pa.....	33.00	33.00	33.00	30.50
**No. 2X Virginia, furnace....	33.50	33.50	33.50	26.50
**No. 2X foundry, Philadelphia.	34.25	34.00	34.00	30.50
Ferro mang., delivered.....	250.00	247.50	302.00	175.00
Bessemer billets, Pittsburgh....	47.50	47.50	58.75	60.00
Bessemer sheet bars, Pittsburgh	51.00	51.00	65.50	60.00
Open hearth sheet bars, Pitts..	51.00	51.00	65.50	60.00
Open hearth billets, Pittsburgh.	47.50	47.50	58.75	60.00
Steel bars, Pittsburgh.....	2.90	2.90	2.90	2.975
Steel bars, Chicago.....	2.90	2.90	2.90	3.19
Iron bars, Philadelphia.....	3.685	3.685	4.935	3.159
Iron bars, Cleveland.....	3.64	3.64	4.50	3.00

*1.75 to 2.25 silicon. **2.25 to 2.75 silicon.

	Prices Jan. 2, 1918.	Average prices Dec., 1917.	Oct., 1917.	Jan., 1917.
Iron bars, Chicago mill.....	3.50	3.50	4.50	3.00
Beams, Chicago	3.00	3.00	3.00	3.19
Beams, Pittsburgh	3.00	3.00	3.00	3.075
Beams, Philadelphia	3.185	3.185	3.185	3.509
Tank plates, Pittsburgh.....	3.25	3.25	3.25	3.575
Tank plates, Chicago.....	3.25	3.25	3.25	3.89
Tank plates, Philadelphia.....	3.435	3.435	3.435	4.909
Sheets, blk., No. 28, Pittsburgh	5.00	5.00	7.75	4.56
Sheets, blue anld., No. 10, Pitts.	4.25	4.25	7.875	4.125
Sheets, galv., No. 28, Pittsburgh	6.25	6.25	8.8125	6.56
Wire nails, Pittsburgh.....	3.50	3.50	3.875	3.00
Connellsville fur. coke.....	6.00	6.00	.....	7.25
Connellsville fdy. coke.....	7.00	7.00	.....	6.375
Heavy melting steel, Pittsburgh	30.00	30.00	31.50	23.25
Heavy melting steel, eastern Pa.	29.00	28.75	26.10	21.50
Heavy melting steel, Chicago...	30.00	28.50	27.00	20.25
No. 1 wrought, eastern Pa.....	35.00	35.00	40.80	26.50
No. 1 wrought, Chicago, net ton	31.00	31.50	31.90	23.75
Rerolling rails, Chicago.....	35.00	35.75	36.00	27.25
Car wheels, Chicago.....	29.00	29.50	25.90	19.75

Big Program

Of New Construction Advanced by Bethlehem Steel Corp. in 1917

The Bethlehem Steel Corp. continued to carry on in 1917 its extensive program of new construction at all its plants. At the South Bethlehem plant blast furnace "B", five stoves and two gas-driven blowing engines were placed in operation. At the No. 3 open-hearth department a 50-ton furnace was installed and at the No. 4 department a 25-ton converter and two 2000-ton tilting furnaces were placed in operation along with cranes, ladles, gas producers, etc. Extensions under way consist of a complete new mold foundry, a 42-inch shape mill, a 12-inch mill for rolling light structural shapes and flats and the installation of a 2000-ton press for hollow forging work. Large extensions to the ordnance plants for the manufacture of various sizes of gun forgings, shell, field carriages and other field equipment are also under way.

At the Steelton plant a new ore bridge, a blast furnace with two gas-driven blowing engines, a 200-ton tilting open-hearth furnace equipped with waste heat boilers and a 20-ton converter were completed in 1917. Three large forging presses will be installed at an early date. Construction has been started on 60 new Koppers coke ovens and by-product plant, a 500-ton blast furnace, new soaking pits and extensions are being made to the splice bar department.

At the Sparrows Point plant a 12-mill sheet and tinplate plant and a 36 x 110-inch three-high plate mill were placed in operation. Additional improvements now under way are two 500-ton blast furnaces, 240 Koppers coke ovens with a complete by-product plant, a complete duplexing plant consisting of four tilting open-hearth furnaces and four converters, a 60-inch universal plate mill, a 40-inch blooming mill, an 18 and 24-inch continuous mill and a salt water pumping station.

The Bethlehem Shipbuilding Corp. has carried on a correspondingly huge program.

Two of the six ore-carrying steamers under construction at Sparrows Point during the past year have been launched and put into service and the remaining four vessels rapidly are being completed.

Many Extensions

Are Made by Youngstown Sheet & Tube Co. in 1917

During 1917 the Youngstown Sheet & Tube Co. made extensive improvements in various departments at its East Youngstown plant. Three 100-ton open-hearth furnaces were completed along with the installation of 12 gas producers, three 616-horsepower waste heat boilers, a low type charging machine, two 100-ton ladle cranes and one 10-ton stock handling crane. To supply the open-hearth department with molten metal, a 1300-ton mixer, said to be one of the largest mixers in the world, was installed. Two additional batteries, each of 51 cross regenerative coke ovens, including the necessary coke and coal handling accessories, have been added. This makes a total of 306 ovens for the company. The output of the by-product plant is being increased 50 per cent. A 9-inch continuous merchant mill with a capacity of 6000 tons of average sections per month was placed in operation last February. A 12-inch continuous merchant mill was completed in September. Construction is under way on an 88-inch plate mill.

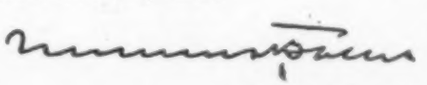
Nation Receives Much But Expects More From Iron and Steel Industry

WAR DEPARTMENT.
WASHINGTON.

The Editor,
THE IRON TRADE REVIEW:—

IT HAS become a truism to say that men, however well trained, are worse than useless if they be insufficiently supplied with the materials which have become increasingly important in modern warfare. With the passing of the time for the adjusting of our industrial enterprises to the specific needs of the military establishment, and with the approach of the time when quantity production will have to build up great store of reserve materials, the call upon manufacturing establishments will become more insistent and imperative. I know that the response will not be uncertain or half-hearted. I know that the word may go out to our men over there that the inner line will not fail them.

December 20, 1917.



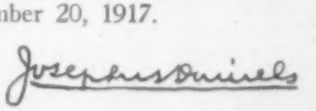
SECRETARY OF WAR.

NAVY DEPARTMENT.
WASHINGTON.

The Editor,
THE IRON TRADE REVIEW:—

THE response of the iron and steel industry as a whole to the call of the nation for increased production of steel, which is absolutely necessary to the successful prosecution of the war, has been gratifying to the navy department, whose requirements are and will continue to be a large factor in the growing demand. On the threshold of this New Year I desire to express my appreciation of the past efforts of the steel industry generally and my confidence that it can and will meet all the tonnage requirements which will be asked of it in 1918. Every mill must keep rolling and every man must do his part to bring about this result. Ships and munitions and more munitions and more ships will win the war. To supply this essential we must have steel and more steel and still more steel.

December 20, 1917.



SECRETARY OF NAVY.

U. S. Steel Works Outstrip Germany

Ingot Capacity Jumps 25 Per Cent in Last Two Years Giving Present Capacity of 48,500,000 Tons—Gain in Last Nine Months is Double Germany's Increase in Three and One-Half Years

DURING the last 24 months, the steel ingot capacity of the United States has increased 25 per cent. The open-hearth furnaces built during that two-year period can produce annually as much steel as the entire country turned out in 1900. This tremendous expansion in steelmaking capacity has placed the United States in a position to face confidently the colossal demands for steel of modern warfare. The estimated steel-producing capacity of the country on Jan. 1, 1918, is 48,500,000 tons. A year ago, the capacity was set at 43,000,000 tons—a figure which the production records of the last 12 months have verified. At the opening of 1916, the capacity was estimated to be 39,000,000 tons, giving an increase in the last two years of close to 10,000,000 tons.

Set up against these figures the steelmaking capacity of Germany is thoroughly overshadowed. That country is estimated to have a steel ingot capacity of about 20,000,000 tons, but her actual output in 1917 is set by the British ministry of munitions at only 16,000,000 tons. This is only one-third of the present capacity of the United States.

When the kaiser forced Uncle Sam into active participation in the war, he arrayed against the overtaxed steel resources of the Teutonic powers, a country which produces nearly one-half of the world's steel. The world's capacity at the opening of 1918 is set at 100,000,000 tons, an increase of about 16,000,000 tons or 19 per cent since the war opened in 1914. Of this increase, 10,000,000 tons are accounted for by expansions in the United States, leaving 6,000,000 tons as the measure of growth for the remainder of the world. England during her three and one-half years of active participation in the war has boosted her productive capacity from about 8,000,000 tons to 12,000,000 tons. Germany in the same period is estimated to have actually gained somewhat less than 2,000,000 tons. During the nine months since the United States declared war on Germany, this country has thus added to her steel capacity as much as England did in three and one-half years, and more than twice as much as Germany did during the same period.

The accompanying table shows the details by companies and furnaces of the growth in steel ingot capacity during 1917. The number of open-hearth furnaces completed last year was 101 with an estimated annual capacity of 5,413,000 tons. This compares with a record of 105 furnaces with a capacity of 4,300,000 tons, built during 1916. The gain in capacity in the past two years thus amounts to 9,713,000 tons, with an increase of 206 in the number of furnaces.

These two years have marked the period of greatest expansion in steel ingot capacity as the new construction record for 1915 showed that 43 furnaces of 1,759,000-ton capacity were built. In 1914, only nine furnaces of 747,000-ton capacity were built while in 1913, 62 fur-

Open Hearths Completed During 1917

	No. of furnaces	Rated capacity, tons	Estimated annual production
Allegheny Steel Co., Brackenridge, Pa.	1	35	27,500
American Rolling Mill Co., Middletown, O.	2	75	50,000
American Steel & Wire Co., Cleveland	1	60	40,000
American Steel Foundries, Sharon, Pa.	2	40	60,000
Apollo Electric Steel Co., Apollo, Pa.	1	100	70,000
Ashland Iron & Mining Co., Ashland, Ky.	3	75	150,000
Bethlehem Steel Corp., Sparrows Point, Md.	4	200	480,000
Bethlehem Steel Corp., South Bethlehem, Pa.	1	50	35,000
Bethlehem Steel Corp., South Bethlehem, Pa.	2	200	240,000
Bethlehem Steel Corp., Steelton, Pa.	1	200	120,000
Braddock Mfg. Co., Braddock, Pa.	1	25	22,000
Brier Hill Steel Co., Youngstown, O.	2	100	140,000
Canton Sheet Steel Co., Canton, O.	3	50	105,000
Central Iron & Steel Co., Harrisburg, Pa.	1	100	70,000
Central Steel Co., Massillon, O.	2	75	100,000
Corrigan, McKinney & Co., Cleveland	4	75	200,000
Cromwell Steel Co., Lorain, O.	4	75	200,000
Donner Steel Co., Inc., Buffalo	6	100	420,000
Edgewater Steel Co., Oakmont, Pa.	1	35	27,500
Edgewater Steel Co., Oakmont, Pa.	1	75	50,000
Erie Forge Co., Erie, Pa.	1	35	27,500
Federal Steel Foundry, Chester, Pa.	2	25	45,000
Illinois Steel Co., South Chicago, Ill.	2	200	240,000
Inland Steel Co., Indiana Harbor, Ind.	2	75	100,000
Interstate Iron & Steel Co., Chicago	2	70	90,000
Jones & Laughlin Steel Co., Pittsburgh	6	50	210,000
Keystone Steel & Wire Co., Peoria, Ill.	1	75	50,000
Lackawanna Steel Co., Buffalo	1	75	50,000
Llewellyn Iron Works, Torrance, Cal.	2	40	60,000
Lukens Steel Co., Coatesville, Pa.	6	100	420,000
Nagle Steel Co., Rahway, N. J.	1	40	30,000
National Tube Co., Lorain, O.	4	80	220,000
Pacific Coast Steel Co., Seattle	1	40	30,000
Penn Seaboard Steel Corp., New Castle, Del.	3	30	75,000
Penn Seaboard Steel Corp., New Haven, Conn.	2	30	50,000
Pittsburgh Rolls Corp., Pittsburgh	1	25	22,000
N. & G. Taylor Co., Cumberland, Md.	1	25	22,000
United Alloy Steel Corp., Canton	4	75	200,000
Utah Iron & Steel Co., Midvale, Utah	1	50	35,000
Verona Steel Castings Co., Verona, Pa.	1	25	22,000
West Penn Steel Co., Brackenridge, Pa.	1	80	55,000
Whitaker-Glessner Co., Portsmouth, O.	1	65	42,500
Wickwire Steel Co., Buffalo	1	60	40,000
Alan Wood Iron & Steel Co., Ivy Rock, Pa.	3	80	165,000
Worth Steel Co., Claymont, Del.	3	90	195,000
Youngstown Iron & Steel Co., Lowellville, O.	2	75	100,000
Youngstown Sheet & Tube Co., Youngstown, O.	3	100	210,000
	101		5,413,000

Open Hearths Building at the End of 1917

	No. of furnaces	Rated capacity, tons	Estimated annual production
Central Iron & Steel Co., Harrisburg, Pa.	1	100	70,000
Chattanooga Steel Co., Chattanooga, Tenn.	2	90	130,000
Crucible Steel Co. of America, Pittsburgh	4	50	140,000
Donner Steel Co., Inc., Buffalo	1	100	70,000
Erie Forge Co., Erie, Pa.	2	35	55,000
Indiana Steel Co., Gary, Ind.	2	200	240,000
Mesta Machine Co., West Homestead, Pa.	1	40	30,000
Pittsburgh Crucible Steel Co., Midland, Pa.	2	60	80,000
Republic Iron & Steel Co., Youngstown, O.	2	80	110,000
Trumbull Steel Co., Warren, O.	7	100	490,000
Utah Iron & Steel Co., Midvale, Utah	1	50	35,000
Worth Steel Co., Claymont, Del.	1	40	30,000
Youngstown Iron & Steel Co., Lowellville, O.	1	75	50,000
	27		1,530,000

naces of 3,120,000-ton capacity were constructed.

On Jan. 1, 1915, the country's annual steel ingot capacity was estimated to be 37,500,000 tons. The new furnaces built during 1915 brought the capacity at the opening of 1916 up to 39,000,000 tons. During 1916, the addition of more than 4,000,000 tons of new capacity led to an estimate of 43,000,000 tons as the country's steel producing capacity on Jan. 1, 1917. The records of the American Iron and Steel institute indicate that during 1917 the actual output of steel ingots was 42,600,000 tons—a figure which checks closely with the estimated capacity as the many new furnaces added during the year were largely offset by irregular operations at most steel plants.

The construction of 5,413,000 tons of new capacity last year brings the estimated total capacity at the opening of 1918 up to 48,500,000 tons. The prospects for growth during 1918, however, are not as promising as at the opening of last year. As shown in the table, 27 furnaces of 1,530,000-ton capacity are now under construction. This compares with a building program on Jan. 1, 1917, of 95 furnaces of 4,795,500-ton capacity. At the opening of 1916, construction work had begun on 74 furnaces of 3,755,000-ton capacity. On Jan. 1, 1915, there were 43 furnaces of 1,760,000-ton capacity being built and at the opening of 1914, 40 furnaces of 1,830,000-ton capacity.

The new construction record of the past two years has shown the rapidity with which building programs have been carried out. Practically all of the furnaces under construction at the beginning of 1916 and of 1917, were completed during those years despite the difficulties experienced in obtaining supplies. On the other hand, of the 43 furnaces under construction at the opening of 1915, 37 were carried over from the previous year.

Expansion in the iron and steel industry during the past few years had been principally in steel ingot and finishing mill capacity. During 1917, however, extensive additions were made to the pig iron producing capacity. The 14 new blast furnaces blown in last year have an annual capacity of 2,182,500 tons, a greater addition than has been made in any other year during the past decade. In 1916, new blast furnace capacity aggregated only 530,000 tons, and the 1915 record showed exactly the same increase.

The following table shows the capacities of the new blast furnaces blown in during each year from 1905 to 1917:

Year	Gross tons
1917	2,182,500
1916	530,000
1915	530,000
1914	None
1913	550,000
1912	1,000,000
1911	565,000
1910	1,794,000
1909	1,930,000
1908	1,188,000
1907	2,065,000
1906	1,135,000
1905	1,292,000

The country's pig iron production in 1917 was about 38,900,000 tons against 39,400,000 tons in 1916. The estimated capacity of all blast furnaces was set last year at about 40,000,000 tons. New additions during the year bring this estimated capacity on Jan. 1, 1918, up to 42,500,000 tons. This figure takes into consideration only those furnaces which are available for operating at the present time.

New Blast Furnaces

The new furnaces completed in 1917 were: One Madeline, Inland Steel Co.; two Gary, Indiana Steel Co.; one Donner, Donner Steel Co., Inc.; one Haselton, Republic Iron & Steel Co.; one Portsmouth, Whitaker-Glessner Co.; one South Bethlehem, Bethlehem Steel Corp.; one Steelton, Bethlehem Steel Corp.; one River, Corrigan, McKinney & Co.; two Cambria, Cambria Steel Co.; one Eliza, Jones & Laughlin Steel Co.; one Coatesville, Midvale Steel & Ordnance Co., and one Sheffield, Sloss-Sheffield Steel & Iron Co.

At the opening of 1918, construction of 36 furnaces with an estimated annual capacity of 5,415,000 tons had been started or authorized. A year ago only 21 furnaces were being built. The furnaces now being built include: Four, National Tube Co., Gary, Ind.; two, Bon Air Coal & Iron Corp., Nashville, Tenn.; one, Alan Wood Iron & Steel Co., Swedeland, Pa.; four, National Tube Co., Lorain, O.; five, Bethlehem Steel Corp., South Bethlehem, Pa.; two, Bethlehem Steel Corp., Steelton, Pa.; four, Bethlehem Steel Corp., Sparrows Point, Md.; one, Brier Hill Steel Co., Youngstown, O.; one, Donner Steel Co., Inc., Buffalo; two, Ford Motor Co., Detroit; one, Gulf States Steel Co., Birmingham, Ala.; two, Indiana Steel Co., Gary, Ind.; two, Iroquois Iron Co., South Chicago, Ill.; two, Lackawanna Steel Co., Buffalo; one, Mark Mfg. Co., Indiana Harbor, Ind.; two, Minnesota Steel Co., Duluth, Minn.

The Worth Steel Co., Claymont, Del., has completed three open-hearth furnaces, each 90 to 100 tons capacity, and the building and equipment have been arranged for the fourth furnace, which, however, has not yet been installed. The latter will not be built until the plate mill has been started.

The Adamson Machine Co., Akron, O., has put in operation at its plant a new 10-ton open-hearth furnace which permits it to turn out considerably increased tonnage of open-hearth castings in addition to its output of converter steel castings.

Rebuilding Furnace

The second stack of the Alabama Co., Gadsden, Ala., is undergoing repairs and reconstruction. It probably will be blown in by the early spring. The output of the rejuvenated furnace is placed by the officials at 400 to 450 tons daily.

New Mill is Ready

The 14-inch merchant mill of the Donner Steel Co., Buffalo, nearly is ready for operation. Production will be started the first of the month it is believed. Additions shortly to be built by the company involve the expenditure of about $30,000 and include a pyrometer house, yardmaster's office, open-hearth department office, blooming mill locker room, carpenter shop and boiler shop.

Soo Commerce in 1917

Despite the many delays imposed by ice and by traffic congestion on the railroads, the commerce through the American and Canadian canals at the Soo fell off only 2 per cent during 1917. The heaviest losses occur in the shipments of flour, wheat and grain. The 1917 shipments of flour were 17 per cent smaller than those of 1916; the shipments of wheat, 18 per cent smaller; and the grain shipments fell off 28 per cent. Iron ore shipments through the canals amounted to 61,374,090 tons. This brings the 1917 shipments to within 3 per cent of those of 1916, and insures sufficient ore for capacity operations at all blast furnaces tributary to the Great Lakes during the coming winter.

The new plant of the Allentown Standard Mfg. Co., Allentown, Pa., has been completed and is about to be placed in operation. At a stockholders' meeting, Henry J. Franklin was elected president and Samuel L. Perlman, secretary and treasurer. The company will manufacture sheet iron and metalware.

Fitting Mill Tonnage to War's Decree

Unparalleled Transposition of Ingot Output is Brought About by the Pressing Demands of this Critical Period—Plate Mills Speeded to Limit to Combat Submarines —Surplus Rail Mill Capacity Rolls Shell Rounds

BY L. W. MOFFETT

TREMENDOUS demands of war have brought about a notable realignment of the steel industry in the United States. There has been a remarkable increase in the rolled output. Diversion of finishing capacity in a manner wholly different from the requirements of normal commercial periods has been the cause of this condition. Today the industry is virtually a government enterprise, the greatest on earth, and is humming as a huge war machine. Its individual owners have practically become agents, highly trained and specialized, who are guiding the operations of this great undertaking in an earnest effort to bring the conflict to a successful conclusion. Their task is immense. They share in large part the responsibility of transforming a great nation from one of amazing unpreparedness to a war basis on a scale so enormous that it was not even conceived of prior to the outbreak of the present titanic struggle.

Before the war demands for large tonnages of steel, as tonnages are looked upon now, were comparatively few. When the railroads freely bought rails, bridges, cars and locomotives, a larger demand for steel was created and prosperity reigned. When they didn't, business lagged, and there was plenty of idle capacity. Railroad requirements under normal conditions took from 33-1/3 to 40 per cent of the total steel output. Rail tonnages for domestic roads accounted for an average of 3,000,000 to 3,500,000 tons annually. Demand for structural material for bridge work, terminal facilities, etc., was heavy normally. There was an active market for merchant bars, pipe and structural material for diversified manufacturing pursuits of a peaceful character. General building was an important factor in the steel demand in the pre-war period. Wire, too, always has been an important branch of the industry, as its demand is widely disseminated. The automobile and other industries took large tonnages.

Then the war came. First, there developed orders from the governments of England and France for shrapnel. These began in November and December, 1914, and involved rounds, principally 3 and 3½ inches in diameter, for export and for domestic manufacture into shells. High military authorities in those countries thought that the conflict was going to be fought with small guns. The German militarists evidently anticipated this opinion. They were prepared, not with small guns, but with large weapons and high explosive shells. This situation had to be met and met quickly. It called for more steel being forged or pressed at the mills and finished at such plants as those of the Westinghouse Electric & Mfg. Co., the Pressed Steel Car Co., the General Electric Co., the American Locomotive Co., and many others in all parts of the country. A great tonnage of steel now is going into the heavier classes of shells, including those for guns of 6-inch caliber and larger. At the same time, a considerable quantity is going into the manufacture of ordnance. Included among the unusually large shell rounds which have been called for are 10, 11, 12 and up to 15 and 16-inch diameter. These now are being rolled in numerous mills, whereas prior to the war perhaps not more than two of these plants were equipped to produce rounds larger than 10 inches in diameter. These large sizes then were produced for wheel blanks.

The production of these extra large rounds called for various roll modifications. Engineers say this was a comparatively simple matter. At Midland, Pa., rounds have been rolled on a 28-inch mill. Several blooming mills were changed to produce this form of tonnage. One jobbing sheet mill has made 3-inch rounds after cutting grooves in the rolls. A rail mill at Braddock, Pa., has been engaged in rolling large rounds and sheet bars. A 35-inch structural mill at Munhall, Pa., has rolled rounds up to 16 inches in diameter. A 40-inch blooming mill at Youngstown, O., has been rolling 9 x 9-inch gothic sections. A rail mill at Johnstown, Pa., has also rolled large rounds to make 7-inch shells. Rolling large rounds on rail mills has become a rather common practice in this country since the war and has been followed at Buffalo, Ensley and at other plants.

Next came the submarine warfare. This meant the immediate need for ships which at once required a tremendous amount of steel for plates. Shipbuilding now is taking the largest quantity of steel produced by the manufacturers. The plate capacity in America today is about 400,000 tons a month, or 4,800,000 tons a year, including universal and sheared plates. Of the actual production of plates, at least 50 per cent, and probably more, is going into ships. Heavy steel tonnages also are going into forgings, anchors, etc. The plate capacity at present obviously calls for a much greater ingot tonnage than the normal amount of steel devoted to plate rolling in former years. In order to obtain a greater output of plates, raw steel has been diverted from other finished lines, such as merchant bars wherever the intended use was regarded of a more or less nonessential character. Other finished products were equally affected, such as structural material for office buildings, sheets for automobiles, strip steel for automobiles, bicycles, etc., steel for shoe nails, music racks, etc. War uses of cold rolled shafting have been numerous and tonnages have been taken for airplanes, detonators, trench mortars and for the Emergency Fleet corporation.

Demand for plates has resulted in the completion during the past two

War Fixes Production

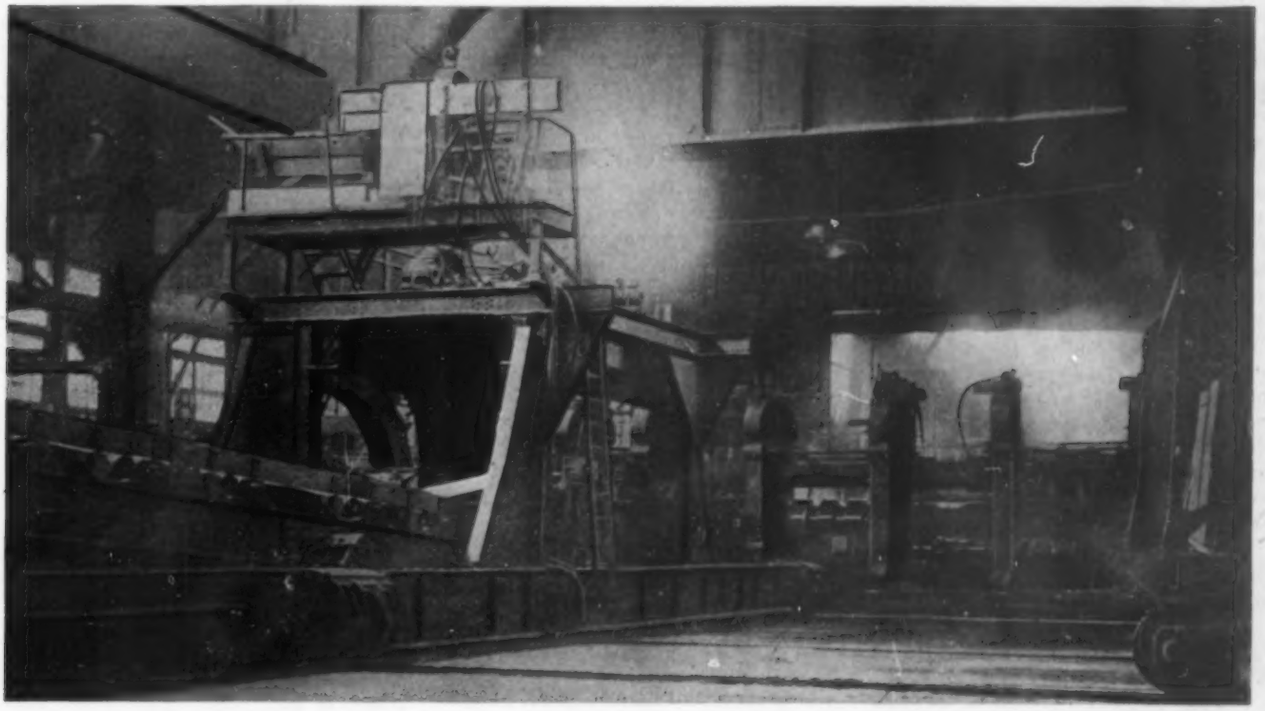
WAR with its insatiable demands for iron and steel tonnage has forced a considerable dislocation of normal production and distribution of the mills. Certain lines of manufacture have been overstimulated; others have been suppressed in a proportionate degree. This transposition has been so extraordinary that it has created certain conditions which are likely to outlive the present war emergency. Mr. Moffett covers the various conspicuous examples of a revamped operating condition and interprets their significance for the future.

years or the putting under construction of a largely increased capacity, estimated at from 100,000 to 125,000 tons a month. The total production of sheared plates ¼ inch and thicker in 1916 was 1.865,642 tons. Estimates have been made that government merchant ships alone will take approximately 2,000,000 tons of plates in each of the next two years. This does not take into account the heavy requirements for naval vessels or shop construction, for the building of cars and locomotives for American railroads abroad, and of many war plants built by private manufacturers, or for harbor, wharf and munition plant construction in France by the war department and for many other undertakings.

Steel ingot production in 1917, according to an estimate made by the American Iron and Steel institute, will not show more than 42,600,000 tons, compared with 41,401,917 tons in 1916. Estimates were made in the latter part of September, 1917, that the government steel needs for the two months following would be 7,000,000 tons, or the full ingot production of that period. The decline in the output of ingots in 1917, as compared with the previous estimate of 45,000,000 tons, was due to the curtailed production of pig iron brought about chiefly by fuel shortages. The proportion of the plate tonnage to the ingot output in 1916 was approximately 9 per cent, as compared with an estimate of 11 per cent for 1917. In 1912, it was 9 per cent, in 1913 10 per cent, in 1914 9.5 per cent, and in 1915 9 per cent.

Over stimulation in some classes of iron and steel demand, particularly for plates and large rounds, necessarily has brought about a contraction in other lines. It has caused an interesting transposition of steel tonnage. Bar and billet mills have been called upon to produce a tonnage much greater in proportion to total ingot output than under ordinary conditions, and the output of other mills has been reduced accordingly. Rail production in 1917 was relatively light. This enabled rail mills to be diverted to the production of large rounds. A conspicuous case wherein the tonnage has declined to offset the over stimulus in other lines is that in structural shapes, especially for building purposes. This is clearly reflected by the report of monthly fabricated awards presented by the Bridge Builders' and Structural society, as is denoted by an accompanying diagram. The falling off in structural awards in 1917 was most marked. For the 10 months ending with October, the lettings approximated 950,500 tons, or 54 per cent of the annual fabricating capacity of the country. This tonnage furthermore included a large amount of purely war construction. The years 1915-16 saw practically the same totals for lettings, that for the former year being 1,486,000 tons and for the latter year 1,496,000 tons, or in each instance, 72 per cent of the total capacity. These figures compare with 1,073,100 and 1,074,360 tons, or 52 per cent of shop capacity in 1914 and 1913, respectively. These years represented a period of extreme depression. Lettings in 1912 totaled 1,335,100 tons, or 66 per cent of the fabricating capacity.

The decline during November and December, 1913, and all of 1914 was in keeping with the general situation of the industry and the country. But it was entirely inconsistent with the prosperous conditions which have prevailed thereafter particularly in 1916 and 1917. The reason for this seeming trade anomaly is simple. It largely is a question of price. At the same time it must be kept in mind that the high prices of structural shapes have been due not so much to the demand for this product itself as to the fact that there has been a place in some rolled line for every ton of ingots turned out so that all finished lines have been strong.



35-INCH STRUCTURAL MILL USED TO ROLL 16-INCH ROUNDS

Much of the fabricating shop capacity of the country now has been given over to the turning-out of tonnage for the building of merchant ships by the government. An example of the diversion of fabricating tonnage from commercial lines is shown in the case of a large fabricating shop which has about 70 ships on hand. This means a loss of 157,000 tons of steel for bridges and buildings, equivalent to 25 per cent of the entire capacity of the plant.

Ordinarily the rounds which were

produced for military purposes at the outset of the war would be considered merchant bars, or such as are rolled on a merchant mill. With the constant growth of demand, it was found convenient to roll large rounds on rail and shape mills. During the preceding eight years rail mills were operated at a rate far below capacity. Rail demand had decreased at a time when rolling capacity has increased. Today it is impossible to place orders for any sizable tonnage of rails for delivery before 1919, despite the fact that the demand is greatly less than the capacity.

Plates Absorb Big Tonnage

Heavy demand for plates for shipbuilding did not develop early. This is shown by the schedule of prices. The plate market was rather weak throughout 1915, when compared with levels existing for related products. In March, 1916, 18 months after the war began, plates commanded unusually high prices, when considered in connection with levels for other steel products involving virtually similar costs of production. Plate prices continued to increase until in August, 1917, when the average was 8.80c, Pittsburgh, the highest in the history of the industry. The tremendous demand for plates is reflected in the year's record of new capacity added. New mills put in service or now under construction include the following:

Youngstown Sheet & Tube Co., one 84-inch and one 96-inch mill.

Brier Hill Steel Co., Youngstown, O., one 84-inch mill, and one 132-inch mill.

Tennessee Coal, Iron & Railroad Co., one 110-inch mill at Fairfield, Ala.

Donner Steel Co., Buffalo, one 84-inch mill.

Carnegie Steel Co., one 110-inch mill at Homestead, Pa.

Nagle Steel Co., Pottstown, Pa., one 54-inch (rebuilt).

Indiana Steel Co., Gary, Ind., one 160-inch mill.

Lukens Steel Co., Coatesville, Pa., one 204-inch mill.

Jones & Laughlin Steel Co., Pittsburgh, one 128-inch mill at Soho plant.

The General Steel Co., St. Francis, Wis., plan one 104-inch mill.

Industries that work up steel were dislocated extensively. Producers of machinery soon after the war broke out were given huge orders for lathes and other tools. Demands poured in upon them from both domestic and foreign plants engaged in making shells. Orders from the United States government now fill the books of machine tool makers to overflowing. They call for the maximum output of the enlarged industry. In addition, capacity is being further increased. When the war demands called for heavy orders for tools, domestic consumers of similar requirements were either shunted aside, or deliveries on contracts they had placed were greatly deferred. The steel industry suffered. It was not able to fill adequately machine tool requirements. Since the United States entered the war, the government exerted every possible effort to see that nothing interfered with the production of war tonnage, manufacturers having government contracts being given priority in machine tool requirements. The necessity of this kind of equipment in keeping steel highly efficient under war conditions was strikingly emphasized.

In the matter of railroad rolling stock, there was a sharp dislocation in the market. The carriers had been slow in making purchases. Up to July, 1914, they were hoping for a favorable decision in the rate case, then pending before the interstate commerce commission at Washington. It was handed down just as the war broke out and was unfavorable. Great apprehension was felt that, due to the war, billions of dollars of their securities, held in foreign countries, would be dumped on the market. The rate case was reopened and the commission in December, 1914, granted some important concessions to the carriers. In May, 1915, they began to place moderate-sized orders for cars and locomotives. When they became anxious for deliveries many of the car and locomotive plants had branched out into shell manufacture. They had also closed contracts for cars and locomotives for export. Steel had become scarce and high in price. Manufacturers of equipment, supplemental to that produced by car and locomotive shops, also took different kinds of war orders. The railroads were unable to obtain adequate requirements. They received only about 3000 locomotives in 1916, or less than 50 per cent of the number they took in each of the years 1906 and 1907. They received only about 100,000 freight cars, or approximately 50 per cent of the number they had been taking in each of the several preceding years.

Analysis of Future Conditions

The position that the steel industry may be in and the problems it will face after the war by reason of abnormal conditions growing out of the conflict, of course, can be the subject for conjecture only. Well informed men of the trade generally look upon the future hopefully. That intelligent handling of the situation will be necessary to properly adjust it to a peaceful basis cannot be doubted. it is believed certain, however, that normal conditions of the past never will return entirely. While the ordinary commercial business will be restored, it is also true many new channels of demand will have been established.

The three outstanding abnormalities of the industry arising from the war are: The creation of a vast munition-making capacity; the heavy addition of plate capacity, and the general redistribution of ingot tonnage.

By far the greatest portion of the munition-making machinery and plants will be useless after the war. Much of it now in good order will be worn out and thrown aside before that time. Disposition of this direct war industry will be an interesting matter to watch. A portion may be taken over directly and maintained by the government, while part of it may be turned to the production of tools for commercial purposes. So far as the financial phase of the situation is concerned the manufacturers of munitions appear to be on safe ground. The equipment cost through profits realized probably will have been amortized.

Adaptability of Tonnage is Evident

The third point—that of the diversion of tonnage, perhaps will not prove a source of much concern to the industry when peace comes. It is a simple matter to change the rolls on a rail mill that has been making large rounds so that it can resume the production of the material for whose manufacture it was designed originally. And the same may be said of the great proportion of the capacity that now is engaged in producing rolled forms other than those for which it was built. Yet there again must be created a market for the output of these mills, the capacity of which has been diverted. Scattered throughout all of the producing districts are numerous plants which have had to forego partly or entirely the serving of their regular trade. To a great extent it may be assumed there will be no difficulty in regaining old customers and in acquiring new ones. Despite this, the effort may be a more urgent one than is generally surmised.

It would seem that one thing that the trade must strive to do is not only to maintain new avenues built up in the export trade, but to develop additional foreign business. Former Ambassador Gerard has said that menace to the trade of the United States will come from Germany as soon as the war is over, in the great merchant fleet that country has constructed since the struggle began and in a socialized system of buying

and selling. Unless the Sherman anti-trust law is "knocked in the head", and combinations of trade permitted in the United States, he has explained, Germany's concentrated contracts from all the nations will wreck America's system, through competition among American industries. Obviously, too, the United States will have to adopt a constructive program of legislation to insure an adequate merchant marine of its own. There are, however, those who doubt that Germany will be able financially to resume its past practices of building up export business through subsidizing its merchant marine and encouraging its system of cartels. Also, it is the view of many that labor in all countries, including Germany, will decline to go back to the lower wages it received before the war. Such a development would bring the labor market of Europe more nearly in line with that of the United States. At the same time it is recognized that labor in the United States is receiving greatly advanced wages since the war began and the old differences in the wage levels of the European and American market may be continued, in which event industries of this country would still be placed in their former disadvantageous position. This evidently could be overcome by such major safeguards as the maintenance of an American merchant marine, of export combinations and perhaps by a protective tariff.

Tonnage for the increased plate capacity with which the country now is provided may come from numerous sources. The railroads will be obliged to resume car buying on a large scale if they are going to progress as they should and their failure to do so would mean the arresting of the development of the country and all its industrial enterprises. The country's apparent rebirth as a marine power holds possibilities of plate demand that scarcely may be measured at this time. A great tonnage of structural steel will be required to rebuild portions of Europe devastated by the war, together with the resumption of commercial undertakings that have been suspended in both Europe and America as the result of the war. Car buying necessarily will be only one of the numerous activities that the railroads of this country will have to resume. Rails, locomotives and other equipment of all kinds, calling for large steel tonnages, will have to be purchased.

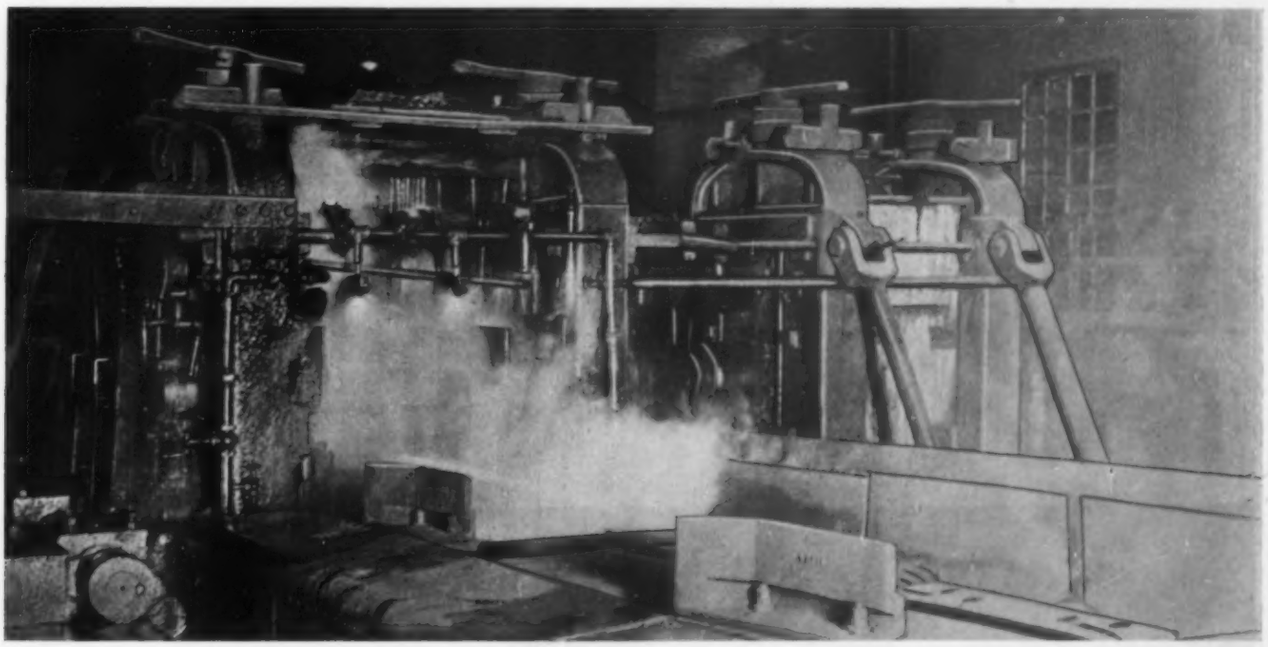
Railroads Must Be Kept Up

The railroads have been greatly overburdened by the immense war business that was thrust upon them like an avalanche. President Hale Holden of the Chicago, Burlington & Quincy railroad recently made a terse statement which plainly indicated the way railroads have been excessively taxed by war demands.

"The people of the country," he said, "might as well get ready to use canals, electric lines, motor trucks, and other means of transportation to take some of the load off the railroads, because in the speeding-up of the great American power machine, the government's demands upon the carriers must be served first." He added that the railroads must be kept in good repair and to do this stood in immediate need of funds. Approximately 25 per cent more freight traffic was handled in 1917 than in 1916, and passenger business of 25,000,000 miles per annum has been withdrawn.

These statements regarding the railroad situation are particularly significant when considered in connection with the view of prominent men in the steel trade that new channels will be open to the industry to help solve the transportation question. Not only do these men agree with the view of Mr. Holden that there will be a broad development of electric and water lines, which will require heavy steel tonnages, but they believe there will be other sweeping changes. For instance, it is believed likely the present system of rural mail delivery will give way to one whereby interurban service will be performed to a great extent by motor trucks with a lessened demand upon railroads.

Viewed in its most far reaching aspects the future of the steel industry is held to be pointed toward a healthy prosperity in the years to come. The United States is and will be in a financial position to give every impetus to the full development of its industrial power. The billions it is spending go to its own business institutions and those that it is lending are amply secured. It remains for the government to adopt legislative policies which will make the United States a vastly greater nation and its industries the leaders of the world.



SECOND ROUGHING STAND OF STANDARD RAIL MILL ROLLING SHELL BARS

How 8 Brothers Run Big Sheet Mill

Country's Largest Specialty Manufacturing Plant Has Been Built Up by Members of One Family, All of Whom Learned Their Trade from Their Father—A Welsh Roller

BARELY a half-century ago, the experimental work carried out by William Kelly in the hills of Kentucky gave birth to the American steel industry. The annals of that 50 years are crowded with reminiscences of fortunes made and unmade almost overnight. The spectacular growth of the industry from one experimental plant to its present position as the source of one-half of the world's supply of steel has furnished the basis for innumerable stories that carry with them the conviction and appeal which fiction lacks.

Eight Brothers Operate Plant

Few of these stories rival in interest the history of the Davey family. The history is barely begun, as the present head of the family is only 46 years of age and their newest plant has been operating only a few weeks. This family is the driving force behind the Mansfield Sheet & Tin Plate Co., Mansfield, O., at present the largest manufacturer of specialties in the United States. The vigor of this driving force is partially explained by the active participation in the company's affairs, from the roller's platform to the president's office, of eight brothers, supplemented by one sister and three brothers-in-law. The full explanation, however, requires an appreciation of the family bond that has led each of the family in turn to serve his full apprenticeship in front of the sheet mills.

The size of the family—eight sons and four daughters—is uncommon enough; the fact that all of the boys took up the same line of work; that they held together, moving from town to town as a family and not as individuals, with the exception of infrequent intervals of brief duration; that they bought out a plant that in other hands had proved a failure and transformed it in three years' time to a powerful factor in the sheet business—all these are not only uncommon but are without precedent.

The Family Start

Just 50 years ago, when the first bessemer converter was still regarded in this country as an experiment, T. P. Davey, a Welsh lad of 18, began his apprenticeship in a tin plate mill in Wales. The skill and dexterity that for many years were held to be the heritage of Welsh rollers were rapidly acquired by the elder Davey.

When his oldest son, Thomas, had reached young manhood, he made the boy his helper. The second son, William, became his father's helper after the oldest son had acquired the art of rolling. Each of the eight sons

An Extraordinary Plant

WHEN an entire family of able men concentrates its energies on the development of a single business institution, an unusual measure of success is a foregone conclusion. In such a case, the policies and methods pursued are freighted with suggestions for the wide-awake plant manager. This article, prepared by an IRON TRADE REVIEW *staff expert, tells how eight brothers manage a big rolling mill. It is replete with new ideas and in addition contains a technical description of one of the country's most up-to-date mills.*

FIG. 1—CONTINUOUS PAIR FURNACES WITH HYDRAULIC CHARGER

A. I. DAVEY
JOHN DAVEY

SAMUEL DAVEY
THOMAS DAVEY

WILLIAM H. DAVEY
JAMES DAVEY

AUSTIN DAVEY
HAROLD DAVEY

FIG. 2—VIEW IN HOT MILL DEPARTMENT

in turn learned his trade from his father, a training that combined the best of Welsh and American practice with the sympathetic tutelage of a parent.

In 1888, after 21 years of experience in the Welsh mills, the elder Davey came to this country. Six months later his family followed him, including the seven sons who had been born in Wales and England, and the eldest of whom already had received their mill training. For six years the family was located at McKeesport, Pa., where the father and oldest sons worked in the Demmler Bros. sheet mill. The next 10 years found the headquarters of the family maintained at Niles, O., where the majority of them worked for the Falcon Tin Plate Co., controlled by Arms Bros., of Youngstown, O. During that period several of the brothers worked in different cities, W. H. Davey, at present president of the Mansfield Sheet & Tin Plate Co., being mill superintendent of the McKeesport Tin Plate Co. for one and one-half years. Later he held the position of general superintendent of the Carnahan Sheet & Tin Plate Co., Canton, O., for three years. He then became associated with A. B. Clark in the construction of the Massillon Rolling Mill Co. plant at Massillon, O., where he remained for six years, or until 1914.

The family had remained closely united during this time, the father and most of the sons following W. H. Davey to Canton and Massillon, O.

In the fall of 1914, W. H. Davey, then vice president and general manager of the Massillon Rolling Mill Co., had an opportunity to purchase the old plant of the National Rolling Mill Co., Mansfield, O., a plant which had been built only a few years previously, but which had operated for only a few months. T. P. Davey, the father, had died only a month before, after spending 47 of the 65 years of his life in the sheet business, and the wish which had been uppermost in his thoughts for years was still fresh in his sons' memories. This wish was that the family remain as a closely knit unit, working together for one common end, the acquisition and control of their own plant. Four weeks

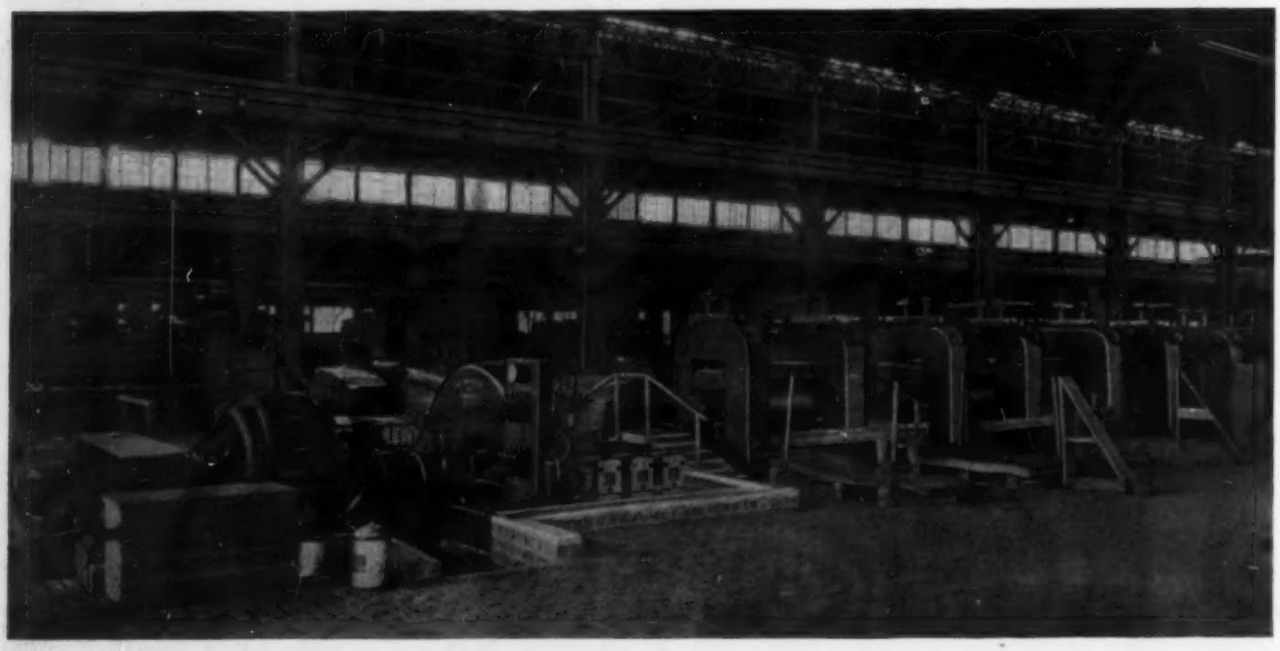


FIG. 3—COLD ROLL DEPARTMENT SHOWING DRIVING MOTOR

after his death the wish was carried out, and with the co-operation of a number of Mansfield business men, the Davey family purchased the Mansfield plant and began its speedy rehabilitation.

One of the Brothers Designs Mill

Sheets were first rolled in the old plant on Jan. 1, 1915, and 23 months later construction was begun on the new plant which has just been put in operation. The plans for this plant were drawn up by Austin Davey, one of the youngest of the brothers. The mill was built under his supervision. It is laid out along modern lines that insure the straight-line progress of the steel from the sheet and pair furnaces on one side to the shipping platform on the opposite side.

The new plant occupies a portion of a tract of 18 acres which was purchased to insure sufficient ground for future expansion. The site is adjacent to the older plant, being separated from the latter by the tracks of the Pennsylvania railroad, which serves the new works. This railroad, together with the Baltimore & Ohio, and through a switching arrangement, the Erie, serve the older plant.

Considerable excavation work was necessary, as the site selected was hilly and somewhat higher than the older property. Swanson Bros., Massillon, O., handled the excavation and removed approximately 40,000 cubic yards. The entire site was leveled so that when desired the construction of additional buildings could be started without delay. The immense but shallow well in which the new buildings lie is enclosed by a wire fence of unusually substantial construction.

The buildings were erected by the Massillon Bridge Co., Massillon, O. The plant includes two parallel buildings, with their long axis running from north to south. These buildings are 546 feet long and 70 feet 3 inches wide, and directly adjoin to form one large structure 140 feet 6 inches in width. On the east side is a standard lean-to, 44 feet 9 inches in width. The lean-to on the west side is 40 feet 5¼ inches in width. Thus the width of the entire mill is 225 feet 8¼ inches.

Specifications of Building

The buildings are of steel construction. The eave troughs of the main buildings are 30 feet 10 inches above the ground level, the height to the eave troughs of each lean-to being 13 feet 6 inches. The crane runways are 19 feet 7¼ inches above the floor. The west lean-to has 7-foot sliding doors throughout its entire length, giving an arrangement that permits excellent ventilation at all times. The upper portion of the sides of each lean-to, as well as the main buildings above the lean-to roofs, are glass. This provides a maximum of light while at the same time these glass windows can be swung open to give increased ventilation, if desired.

The steel and glass construction of the buildings gives a substantial but light structure, as indicated by the fact that the building weighs but one ton to the running foot.

Location of Various Departments

One of the main buildings contains six hot mills, four roughing mills and the bar department. The other main building houses the cold roll and finishing departments. The sheet and pair furnaces are located in the west lean-to, the material being handled on a straight line through the hot mills and finishing departments to the enclosed shipping platform in the east lean-to.

The Mansfield mill is the first to be equipped entirely with the Allis type of continuous pair furnaces. The general details of these furnaces may be seen clearly in Fig. 1, which shows the charging side of one of the furnaces. The bars rest at an angle on the corrugated bottom of the furnace. The bars are charged from the rear of the furnace, being pushed into place by a hydraulic charger. The furnace will hold five heats at one time, the cold charge pushing the thoroughly heated bars out at the front end of the furnace. The cold charge is placed in position while the five in the furnace are being heated, so that the actual charging is done rapidly by one man, who operates the hydraulic pusher through a control at

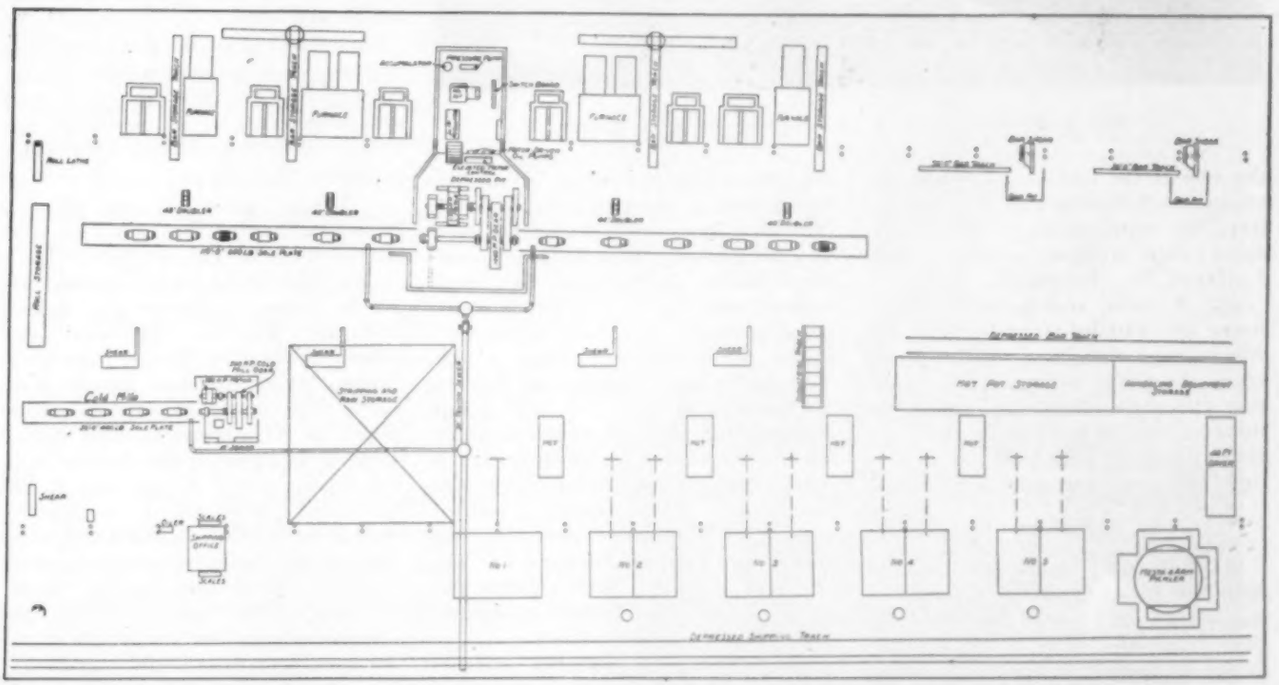


FIG. 4—LAYOUT OF NEW SHEET MILL AT MANSFIELD

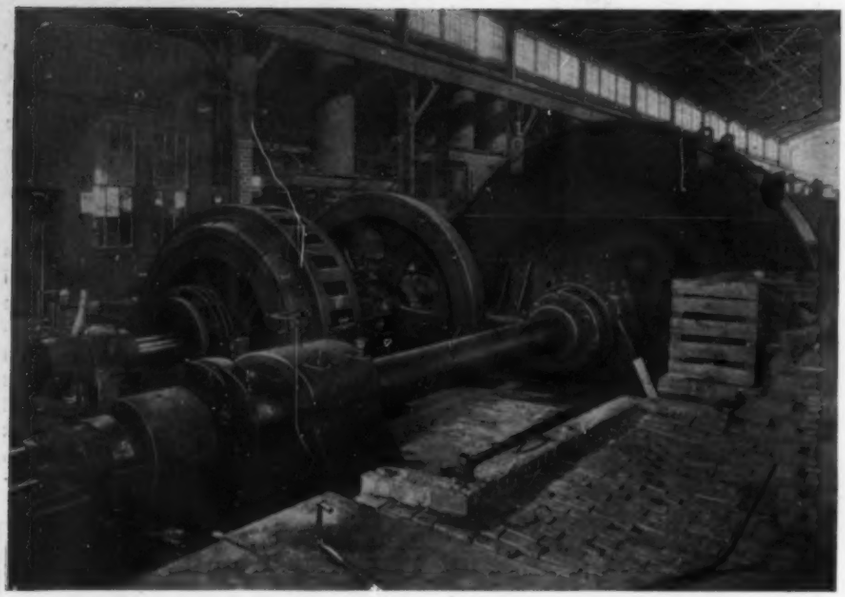


FIG. 5—DRIVING MOTOR AND GEAR FOR HOT MILLS

the side of the furnace. The gas and steam controls also can be operated from the same position. These furnaces were installed by the George J. Hagan Co., Pittsburgh.

Six of these continuous pair furnaces are installed, four being of the double type and two of the single type; these are arranged for operation either on oil or gas. Six sheet furnaces are used, these being of the standard 2-door type. At the present time these are gas fired.

Hot Mill Department

Six hot mills and four roughing mills are installed in the main building directly in front of the sheet and pair furnaces. The hot mills are driven by a 1500-horsepower Westinghouse motor through a driving gear furnished by the Mesta Machine Co., Pittsburgh. The total weight of the gear and flywheels is 370,000 pounds. The rolls are 30 inches in diameter with 24-inch necks. The hot mills, as well as the cold mills, roll lathe and four 156-inch shears, were furnished by the Hyde Park Foundry & Machine Co., Hyde Park, Pa.

In laying out the plant, particular attention was paid to making operating conditions as nearly ideal as possible, thus insuring the maximum of output with the minimum of effort. The hot mill men, for instance, work on water-cooled standing plates. A cold-air system also is provided at each mill. The water-cooled standings are of the Baird type, and consist of a hollow square plate through which cold water is circulated constantly. Fresh air is kept in constant circulation throughout the plant.

The eight cold mills in the finishing department are driven by a 500-horsepower Westinghouse motor through a gear furnished by the Falk Co., Milwaukee. Five double annealing furnaces are installed just north of the cold mills. These are of standard construction, hand-fired, and are designed to handle 10 charges a day. Two 4-arm Mesta heavy type picklers are installed in the north end of this building, the pickling department being the only one in which steam is used. Steam is supplied by a 300-horsepower Stirling boiler, which is housed in a separate structure just east of the pickling departments. The boiler is equipped with stokers furnished by the Combustion Engineering Co., New York.

The auxiliary equipment includes two motor-driven crocodile bar shears furnished by the Youngstown Foundry & Machine Co. These are installed in the north end of the hot mill building, adjacent to the bar bank. Two traveling cranes operate in the finishing department and one in the hot mill department. Two of these cranes are of 20-ton capacity and one of 25-ton. A roll lathe is installed in the south end of the hot mill department, adjacent to the roll storage racks.

Electric Trucks Used

Outgoing shipments are brought to the freight cars on electric trucks furnished by the Automatic Transportation Co., Buffalo. Two of these trucks are used.

The older plant as first rebuilt in 1915 was described in THE IRON TRADE REVIEW, April 22, 1915. The three sheet and three tin mills in service at that time have been supplemented by four additional tin mills.

A Bonnet powdered coal plant is being built just north of the new plant and adjacent to the old mill.

The officers of the company are W. H. Davey, president and general manager; Charles Ackerman, vice president; A. I. Davey, secretary; Samuel Davey, assistant general manager. The board of directors comprises W. H. Davey, Charles Ackerman, A. I. Davey, John Davey, Samuel Davey, Berry Baxter and R. W. Hartman. John Davey is superintendent of the older plant and Harold Davey of the new plant. Austin Davey is construction engineer for the company, while James Davey and Thomas Davey are employed in the hot mill department.

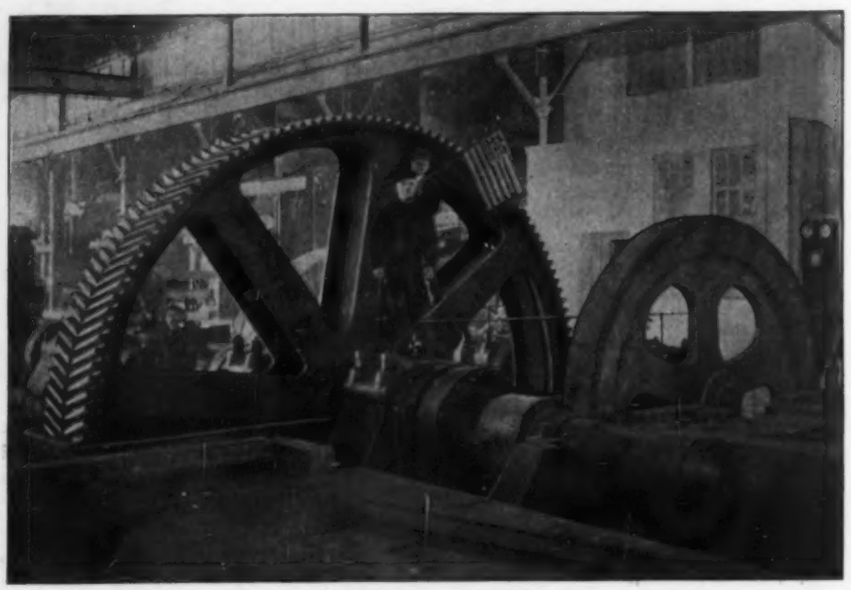


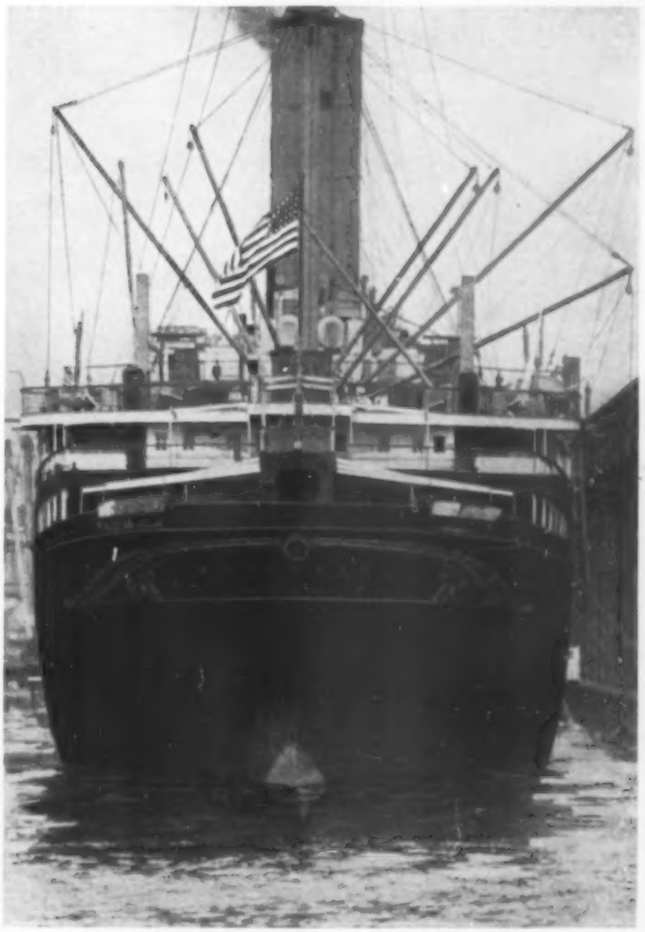
FIG. 6—HOT MILL GEAR

The Welding Tool vs. The Sledge

How Interned German Liners Wrecked by Prussian Vandalism Were Repaired

BY H. COLE ESTEP

The story of a great triumph of American engineering and constructive genius — Radical methods employed to meet an extraordinary situation — A successful counterattack on a thoroughly organized campaign of ruthless destruction — Machinery presumably wrecked beyond repair again placed in service in a few months — German efficiency proved a myth — Over one hundred ships aggregating 675,000 tons have been added to our merchant marine, a priceless acquisition in the present emergency.



THE GIANT VATERLAND NOW U. S. S. LEVIATHAN FLYING THE STARS AND STRIPES

Former German Liners at New York—All Are Now Repaired and Sailing Under the Stars and Stripes

A Counter Attack on German Vandalism

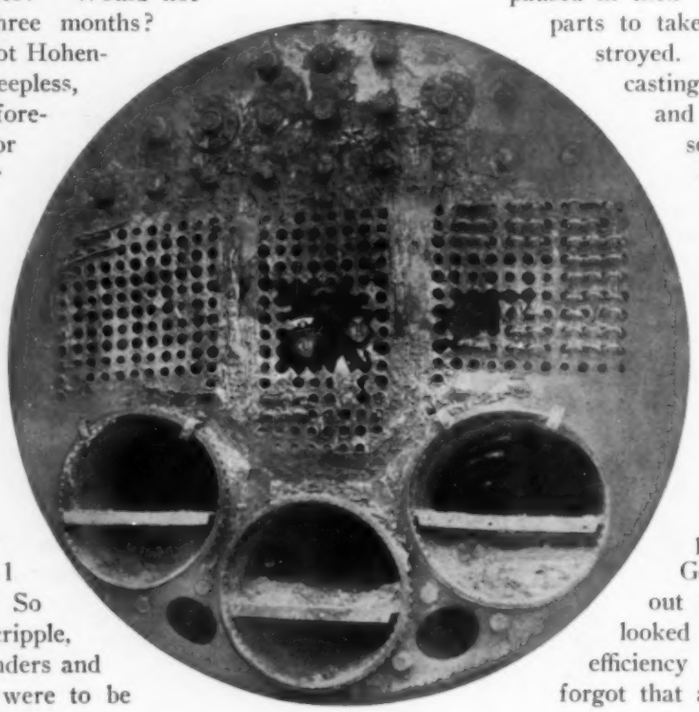
TO all *unterseeboote* commanders: "After Feb. 1 resume unlimited submarine warfare in the barred zones, according to previous instructions."

To the commander of the interned fleet in North America: "Unlimited submarine warfare has been proclaimed. The United States may join with our enemies. She must be prevented from using our ships. *Vorwaerts mit ihren schlageln!* Spare not a single vessel."

Such in effect were the orders spat out from the powerful German wireless station at Nauen a little less than a year ago.

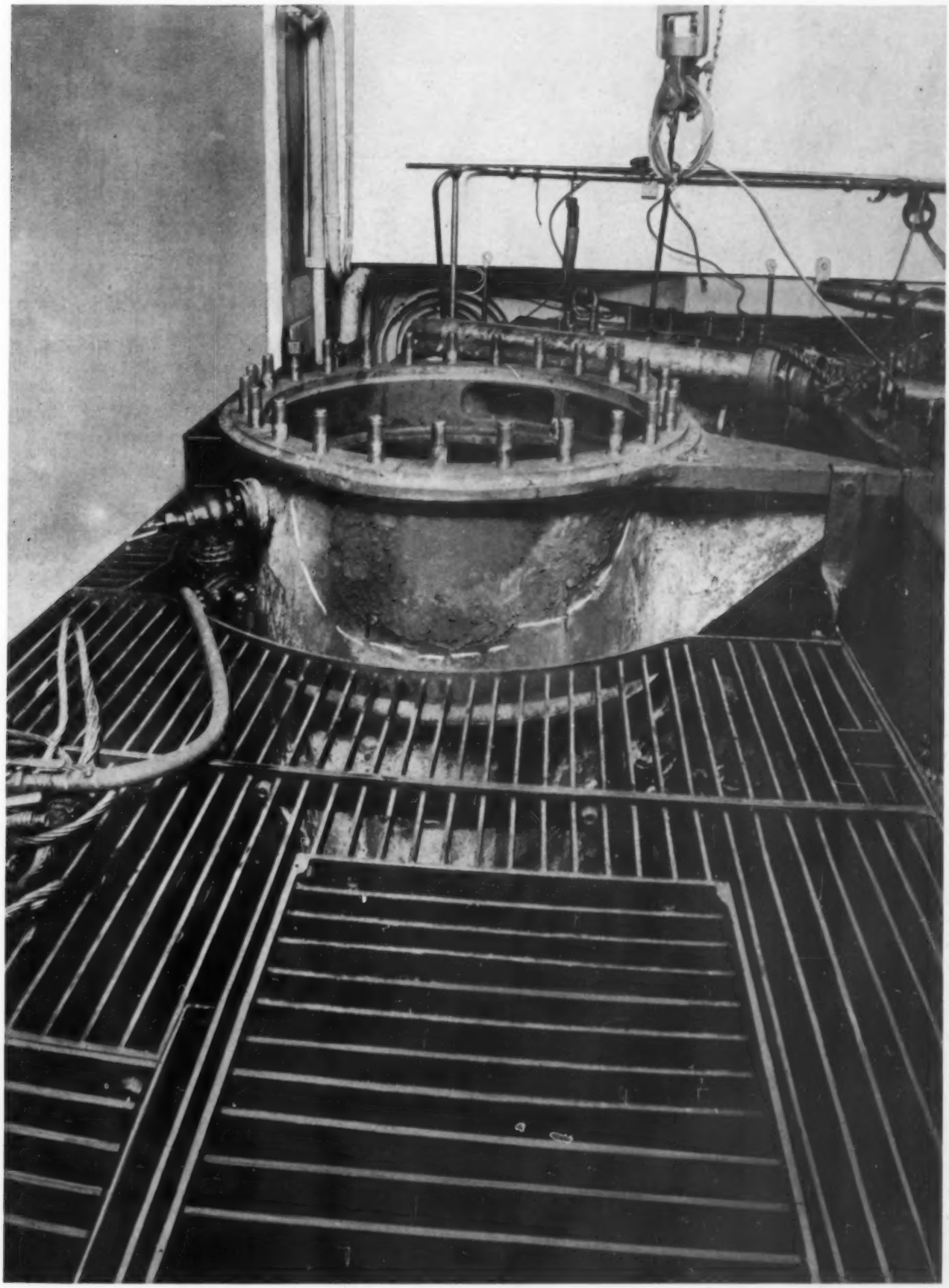
The submarines were loosed. What booted it if America joined the Allies? Would not the war be won in three months? And meanwhile, would not Hohenzollern efficiency, sleepless, painstaking, invincible, forestall any Yankee plans for utilizing the five score or more vessels of the Fatherland interned in American harbors? The plan was simple. The interned ships would be put out of action for the duration of the war. Even Prussianism shrank from their total destruction. They would be needed too soon for the great commercial struggle after the war. So the orders went forth to cripple, but not to destroy. Cylinders and other vital engine parts were to be wrecked, while in the meantime German foundries provided new castings from patterns which they had in readiness for just such an emergency.

For a time events moved smoothly and according to schedule. While neutrality guards policed the piers, Prussian wreckers labored and cursed in the bowels of the interned steamers. For weeks drills were busy; hack saws were active; and battering rams, more ingenious than those rigged before the walls of Carthage, bludgeoned their way through massive and intricate castings. At the same time in pumps and boilers, in fire extinguishers and double bottoms, cunning German minds laid traps to foil American ingenuity. As the work of demolition proceeded in American harbors, German foundrymen paused in their war labors to make new parts to take the place of those destroyed. More than likely these castings were machined, finished and promptly shipped to some convenient port of debarkation, there to await the coming of peace. Thus only could all contingencies be provided for, and the great Prussian god, Efficiency, appeased.



A BOILER DRY-FIRED AND DESTROYED

But even though *Schrechlichkeit* feed on itself, its ends are not always accomplished. In this case the Germans reckoned without their host. They overlooked the difference between efficiency and effectiveness, and forgot that although some men may ruin, others can build. Nevertheless, when the

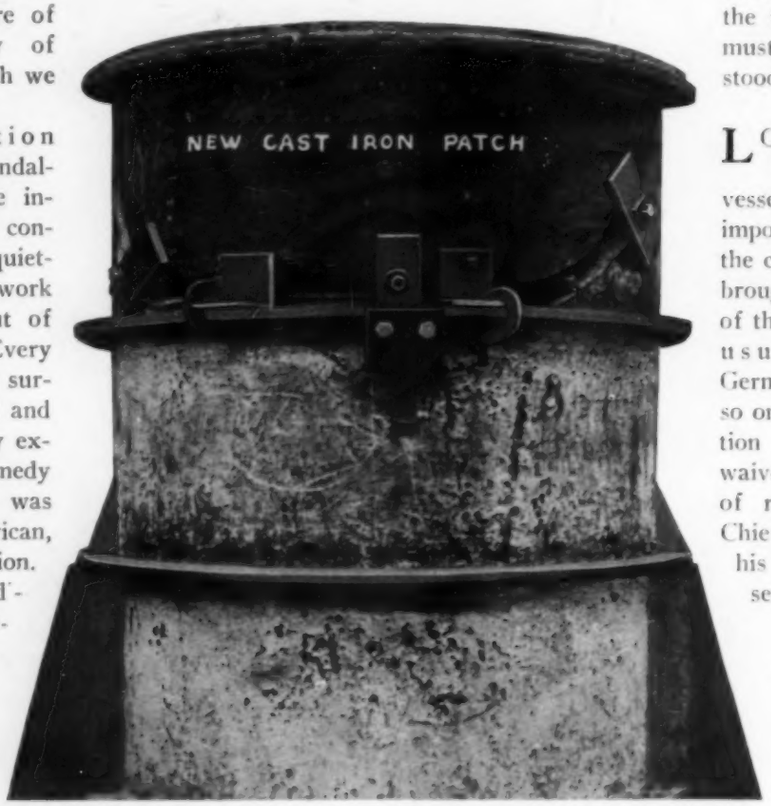


THE WELDING TORCH MADE LARGE CYLINDERS AS GOOD AS NEW

nation awoke to the fact that many of the German ships seized at the outbreak of the war had been systematically and methodically wrecked, the alarm was general and widespread. In April we were still under the spell of the Prussian efficiency bogey. "The eagle's wings have been clipped," sneered the propagandist. We believed him. We had been sold by the great German advertising campaign with its single slogan, "Invincibility". Visions of an army impotent spread through the country. The deathlike inertia of the shipbuilding program added to our uneasiness. It has always been so with the United States. We are unconscious of our strength and unaware of the vast machinery of production amid which we live.

So while the nation worried over the vandalism practiced on the interned steamers, vast constructive forces were quietly assembled and the work of bringing order out of chaos commenced. Every vessel was thoroughly surveyed and its mashed and broken bones critically examined. Then the remedy was prescribed. It was daring, original, American, suited to the situation. Under ordinary conditions, by methods dictated by the traditions of the ship repairing fraternity, at least 18 months would have been required to place the looted vessels again in commission. Meanwhile, Germany might have breached the western front. Fortunately, however, traditional methods were jettisoned. In their stead ideas new to the marine world were brought into play and as a result by Thanksgiving day all of the 109 German merchantmen that fell into our hands in April, freshly painted, refitted, repaired, reconstructed and in many cases vastly improved, were operating on the Atlantic under the American flag. Under the direction of American naval crews they are now bearing no inconsiderable portion of the traffic burdens of the war. As a matter of fact, the actual work of repairing the damage wrought by German vandals required but little over four months' time; no vessel was delayed for a single day as a result of Prussian vindictiveness. In every case the time necessary to repair the wanton destruction perpetrated by the German crews was less than that required for the ordinary fitting-out operations and for the work of converting the larger liners into transports.

In brief, in a great contest between destructive and constructive forces, the constructive organization won hands down. Prussian efficiency was beaten at its own game. American genius for big undertakings again proved its capacity. And herein lies a story that should be familiar to every patriotic citizen. Before it can be told in any detail, the nature and extent of the damage to the German steamships must be thoroughly understood.



Pieces were broken out of large cylinders and thrown overboard. It was necessary therefore to make a pattern to fit the break and then to cast a new piece, which was welded to the main body of the cylinder. This shows a cast iron patch ready for welding by the oxy-acetylene process. Special clamps are used to hold the patch securely in place for welding. This weld was not caulked and no anchor studs were used.

* * *

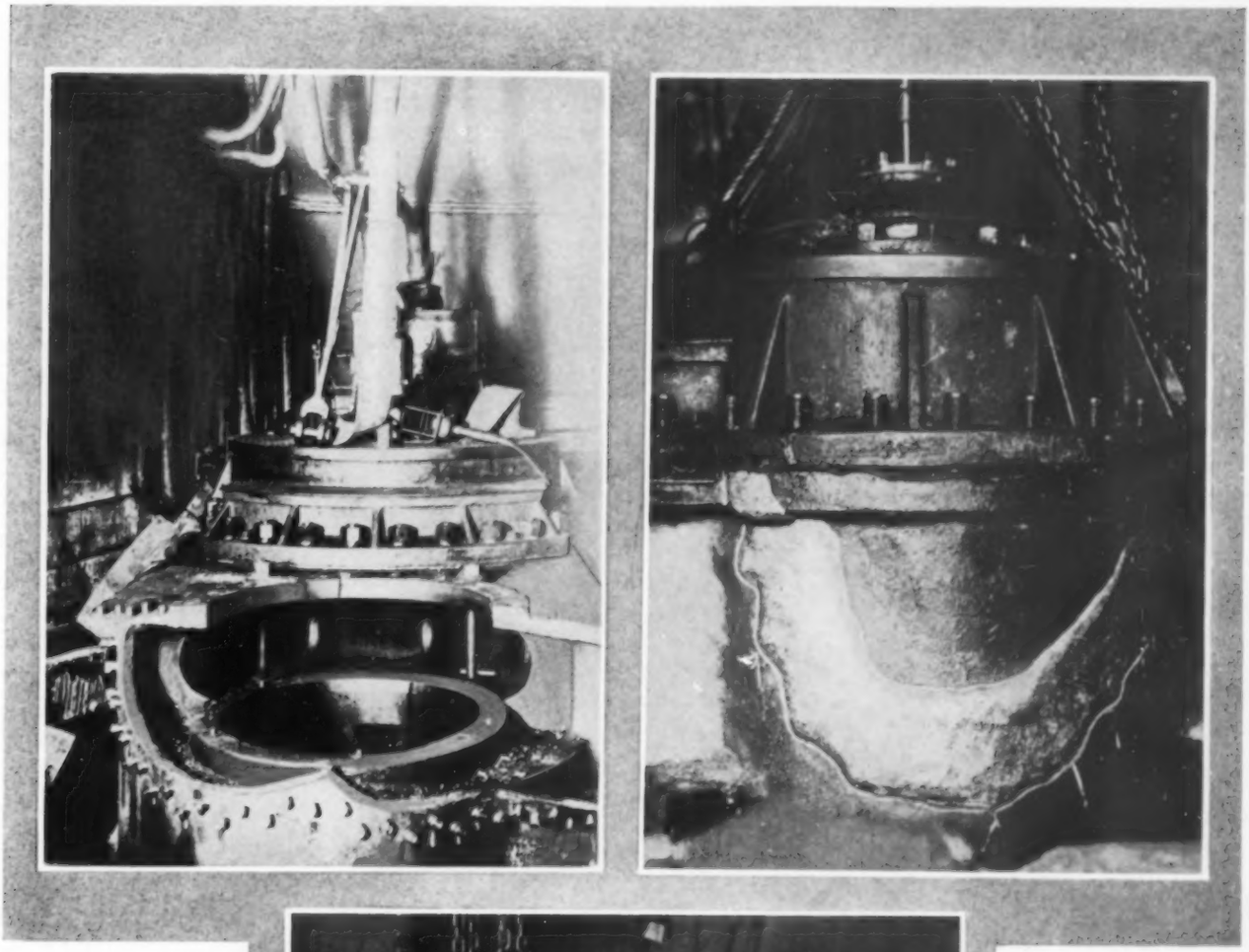
LONG months of idleness on the interned vessel, with nothing more important to do than wind the chronometer, had brought about a relaxation of the strict discipline usually maintained on German merchant ships, so on the morning in question Captain Werner waived the prerogatives of rank and sought out Chief Engineer Richter in his log room, instead of sending for him.

"I haf orders for you," the captain announced.

"Sehr gut," Richter rejoined, laying aside his carved meerschaum pipe. "It is time we got into the active service of the Fatherland. For nearly three years we have done nothing but pump out *der* bilges, while our brothers and all our friends are serving in the armies of the Kaiser. Even though we sink on the way over, we shall be doing something. When do we get up steam?"

"Never," said the captain. "We are not to run the blockade and be helplessly sunk or captured by those dogs of English. Our orders are much more subtle. The high command has seen fit to loose the U-boats. In three months, six at the most, England will be starved. Meanwhile America, nominally at least, may enter the war. Our ships must not fall into the hands of the Yankees, so our orders are to put them out of action for the period of the war."

"Let it be so," muttered Richter, although his dis-



The electric welds usually were anchored by ⅞-inch steel studs screwed into the main portion of the casting along the line of the break. These studs were staggered and the welding metal threaded around them. The two illustrations at the top of the page show a high-pressure valve chest before and after repairing by electric welding.

Cast-steel patches were used on most breaks repaired by electric welding. The line of the weld was trimmed to a V-shape. The welding metal was laid on in layers, using steel welding wire and the arc welding process. Ingenuity was required in arranging the rigging and clamps holding the patch in place while the work was done.

appointment was plainly evident, and his face fell.

"It is on you, *Herr* Chief," the captain continued imperturbably, "that most of the burden of executing these orders will fall. Certain vital parts of the engines and pumps are to be damaged beyond repair, so that by the time the Americans have made new designs, prepared the drawings, worked out the patterns and finished the castings necessary to replace the parts we are to demolish, the war will be over."

But Richter was thinking only of the machinery he had coddled, nursed and petted for years. "My poor engines," he murmured, "they have served me well. It is like shooting one's dog. A thousand times over would I risk death running the blockade."

The captain was disposed to humor his chief's whims.

"Don't worry," he soothed, "it's only temporary. Our world-encompassing, efficient system overlooks nothing. New castings will be ready for you when you need them."

He handed Richter a packet.

"Here are the orders. Execute them, for the Fatherland!"

A remnant of Richter's three years in the Germany army surged to the surface. He saluted.

"Zu Befehl, Herr Kommander!"

The captain departed and Richter undid the packet of orders. They were brief, but explicit.

"Immediately upon receipt of these instructions," Richter read, "you will commence the work of demolition, taking care to follow our directions accurately, so that the work of reconstruction at a later date may not be hampered. You will smash as large pieces as possible out of the following engine parts: Cylinders, steam nozzles, valve chests, cylinder liners, cylinder covers, and circulating pump casings. This can best be accomplished by first drilling the parts in question with a series of 2-centimeter holes arranged either in the form of a circle or a letter U. The holes should be as close together as possible, so the pieces will break out easily with a hand sledge. Throw the broken pieces overboard. If you have time, you also can crush the valve chests and cylinders by rigging a battering ram from your chain tackle. A piece of spare shafting will serve for a ram. Piston valves should be removed and thrown overboard. Disconnect the throttle valve also and throw it overboard. Smash the engine room telegraph. Remove the glands from the stern-tube stuffing boxes and strew them through the bilges, thus filling the stern-tube compartment with water, necessitating the docking of the ship. Finally, empty the boilers of water and dry-fire until the tubes are destroyed. Take care to so conduct your operations as to avoid suspicion. Broken pieces, valves, etc., that are to be thrown overboard should be discharged at night, not in the daytime. Do most of your work at night."

This illustration shows a large oxy-acetylene weld on the port low-pressure cylinder of the former German steamer RHINE. *The welding seam is 80 inches in length. No anchor studs were used on this weld. Slag and other impurities are worked out of the weld by manipulation of the torch aided by a flux. Welds such as this have shown a test efficiency of 100 per cent.*

Richter turned to the speaking tube that led down into the engine room.

"Send up Schlamacher," he ordered.

When his assistant had appeared he read him the orders for the destruction of the machinery.

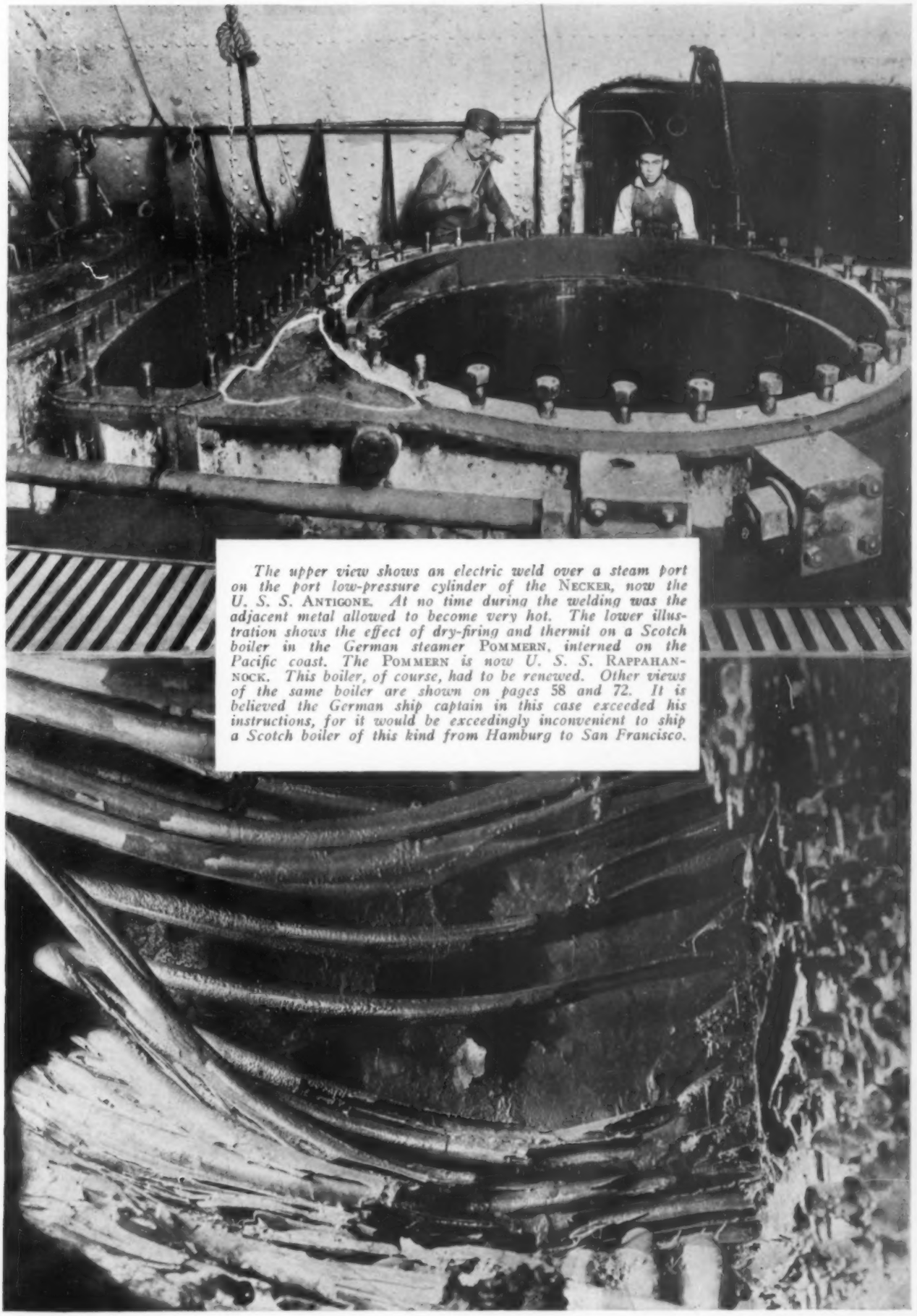
"You will proceed at once," Richter concluded, "and be careful to follow the instructions explicitly. I shall oversee your work myself."

Before long the grinding of drills and the crashing of sledges against metal was mingled with stout German oaths throughout the after portion of the ship. The wreckers were at work.

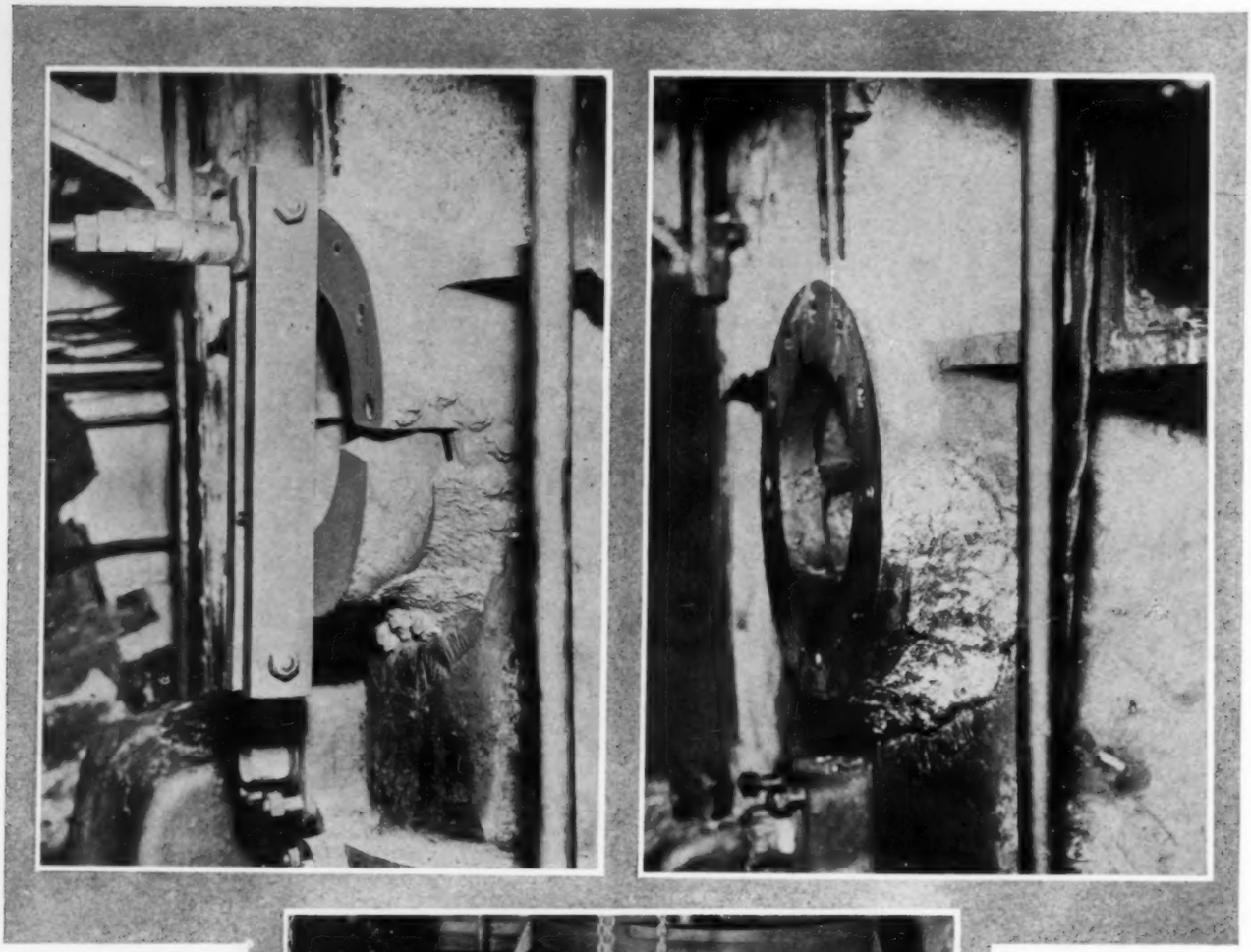
* * *

ALTHOUGH cast in the form of fiction, the foregoing fragment of narrative describes accurately the more obvious forms of destruction inflicted on the interned German merchantmen in American harbors between the resumption of unrestricted submarine piracy on Feb. 1 and our declaration of war early in April. On the latter occasion, 103 German vessels of all types resting in American harbors were taken over by the authorities of the United States. Since then six more have been added to the list, making a total of 109 vessels now carrying the stars and stripes in place of the black, white and red ensign of the Kaiser. Fully 50 of these ships, when seized by the American authorities were found to have been more or less damaged in accordance with the plan detailed in the foregoing.

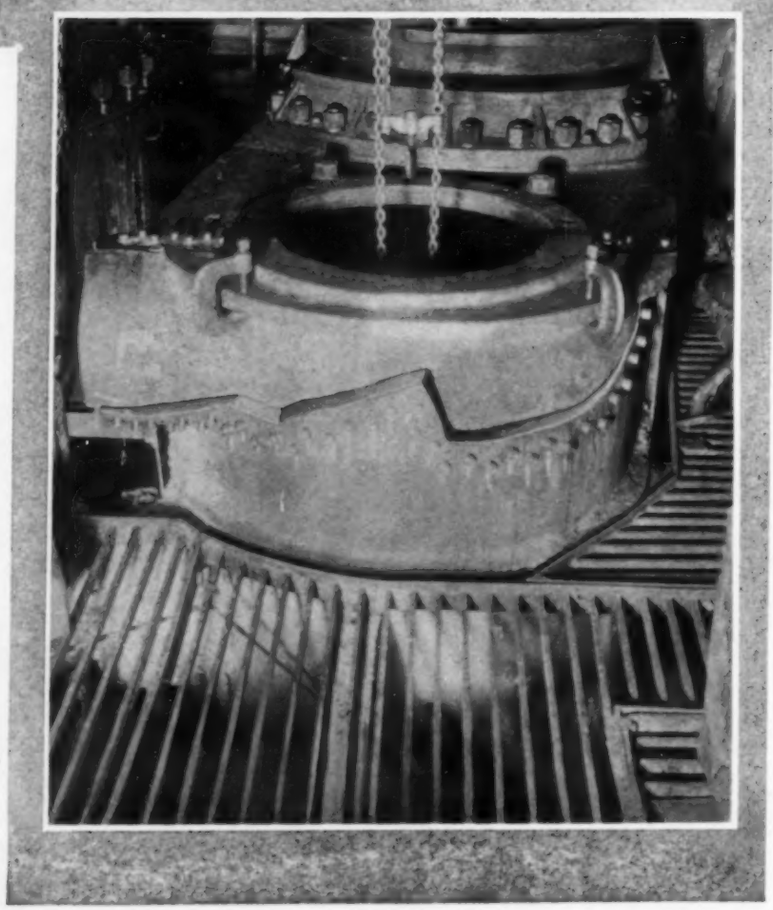
The boats along the Atlantic coast in the vicinity



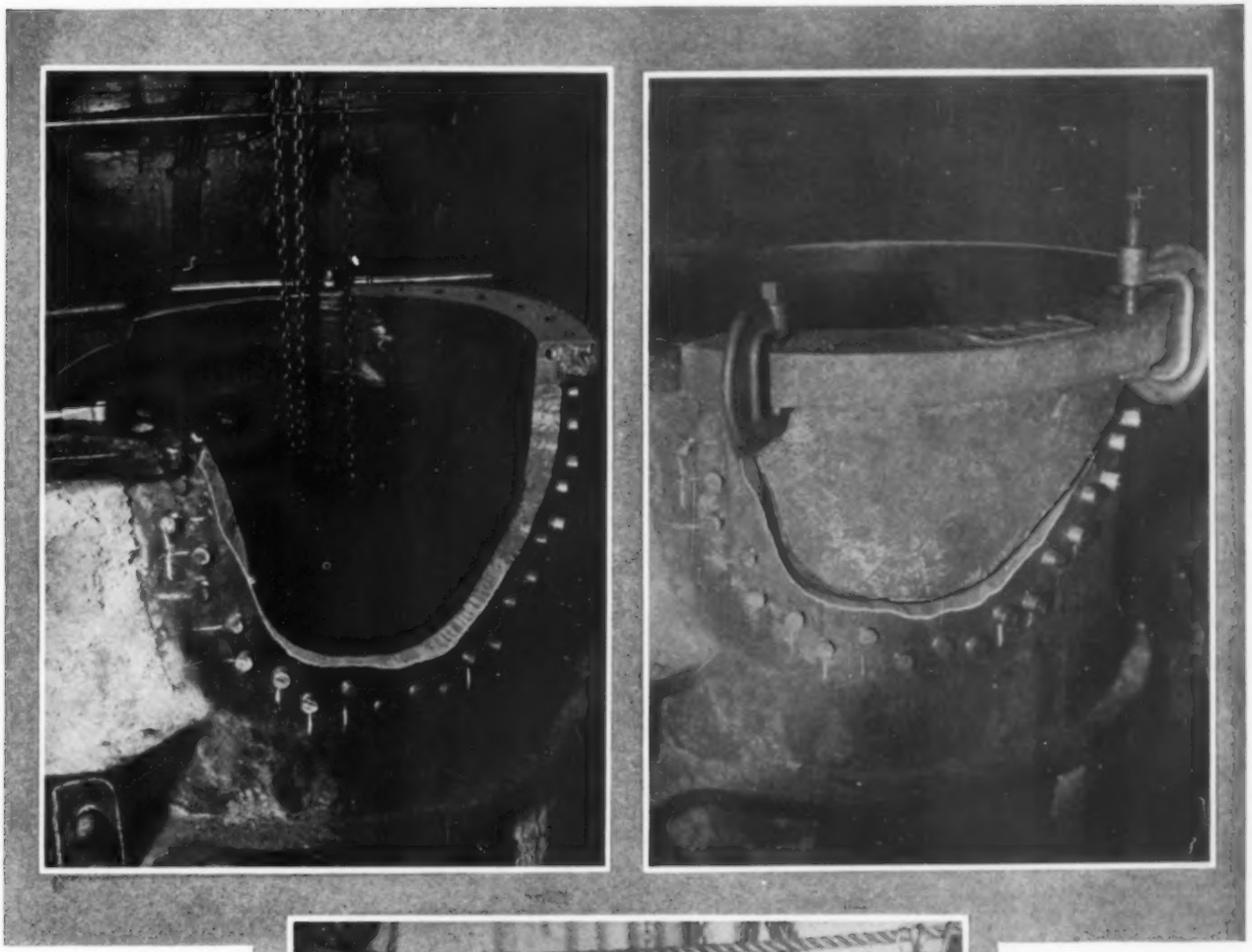
The upper view shows an electric weld over a steam port on the port low-pressure cylinder of the NECKER, *now the U. S. S.* ANTIGONE. *At no time during the welding was the adjacent metal allowed to become very hot. The lower illustration shows the effect of dry-firing and thermit on a Scotch boiler in the German steamer* POMMERN, *interned on the Pacific coast. The* POMMERN *is now U. S. S.* RAPPAHANNOCK. *This boiler, of course, had to be renewed. Other views of the same boiler are shown on pages* 58 *and* 72. *It is believed the German ship captain in this case exceeded his instructions, for it would be exceedingly inconvenient to ship a Scotch boiler of this kind from Hamburg to San Francisco.*



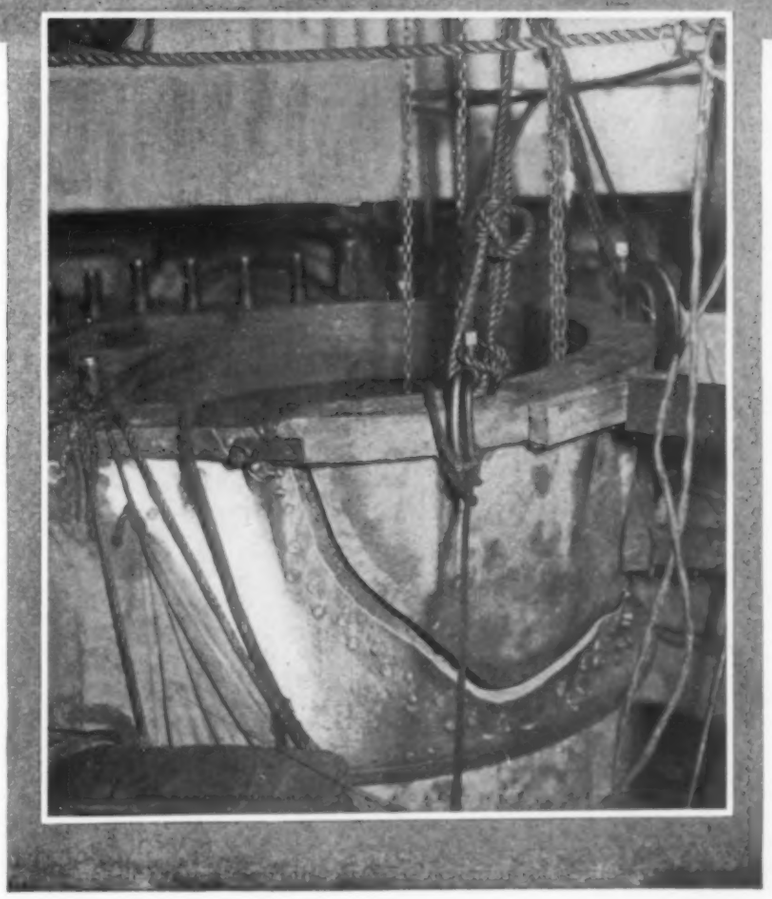
Many steam nozzles were broken. They were repaired by electric welding by the method illustrated at the top of this page. Special clamps were designed to hold the parts together while being welded. The cord-like structure of the weld is clearly shown at the left, while the view at the right shows the effect of peening or caulking.



The view at the left shows the break in the first intermediate pressure valve chest of the Princess Irene now the U.S.S. Pocahontas. The cast-iron patch has been fitted ready for welding. Many saw-toothed breaks such as this were repaired by electric welding. Special efforts were made to avoid overheating which induces shrinking and cooling strains in the weld. The success of the weld depends in a large measure on the skill of the workman.



Where feasible, anchor studs are placed in the face of the weld as shown at the left. When the weld is finished the whole surface is gone over with an air caulking tool. This has been found to be very important in electric welding. Hard spots are disclosed and porous sections closed up by the peening process. Peening is now considered essential for safety.



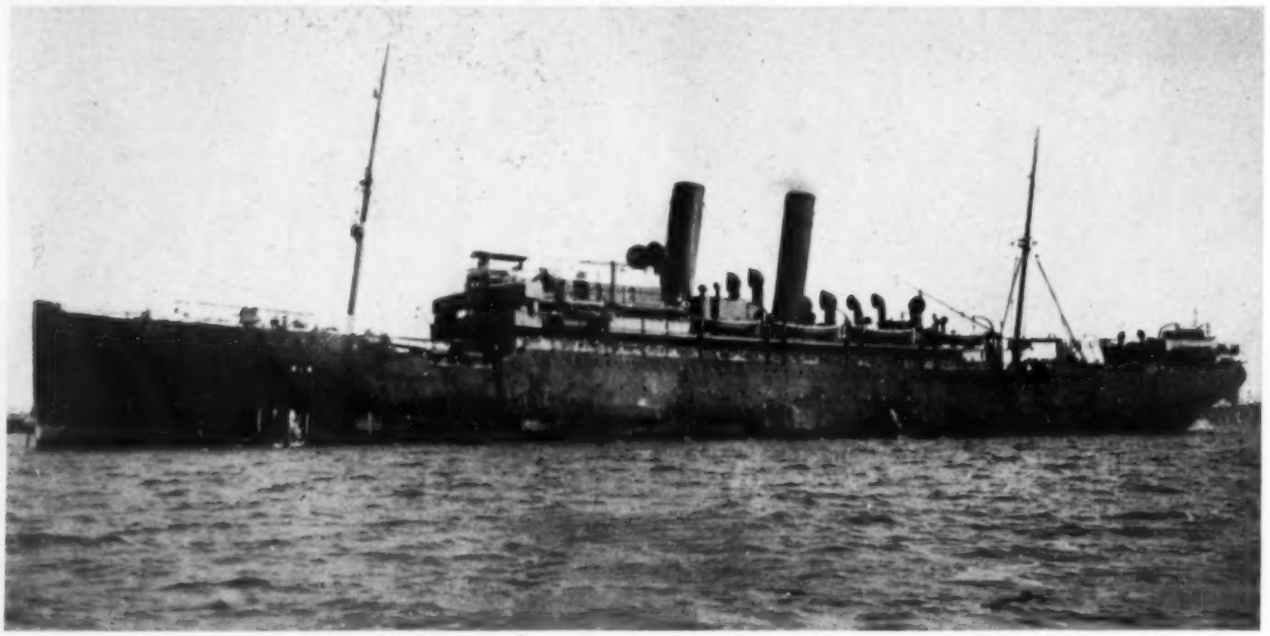
The view at the right shows the elaborate rigging and blocking necessary to secure the patch in place prior to welding. The preparation of the weld is half the battle. With the patch in place and the edges of the weld properly chamfered the arc welding proceeds by first building up the edges of the V-slot from one end to the other and then filling in between these steel-plated surfaces with the welding material.

of New York, Boston and Chesapeake bay were the most completely wrecked, probably since they were closest to the headquarters of the Germans in charge of the vandalism. It is now believed this work was directed from the Hamburg-American Line offices in New York, with substantial connivance on the part of the German embassy at Washington.

Practically all the boats were damaged in the same manner, which would indicate that general instructions had been issued to all commanding officers by the same central authority. The parts damaged, as a rule, were those probably on hand as spares in the home ports of the vessels, or easily procurable from patterns, jigs, etc., already provided. Had not this country entered the war, the ships could have been again commissioned with a minimum of trouble by utilizing spare parts already provided. Smashing cylinders and valve chests was a favorite form of destruction. On the steamers RHEIN, NECKAR and BULGARIA turned over to the Norfolk navy yard for repairs, 17 of the 24 cylinders on the three ships were damaged, 15 so badly that they required welding.

The reader should not assume, however, that the German vandals confined themselves simply to obvious smashing and plain, unvarnished destruction. On many ships there was evidence of finesse and ingenuity in thinking up clever tricks. In some cases Prussian imagination fairly ran away with itself. On one ship the fire extinguishers were emptied and refilled with gasoline. In another case, electric light globes were ground to a powder which was put in the oil pumps, there to be distributed to the various bearings. Of course, to the nation guilty of the rape of Belgium, such tricks as these must have seemed mere child's play. Probably they represent simply the playful mischievousness of the ship's engineers after they were through with the heavy battering and smashing of their day's work.

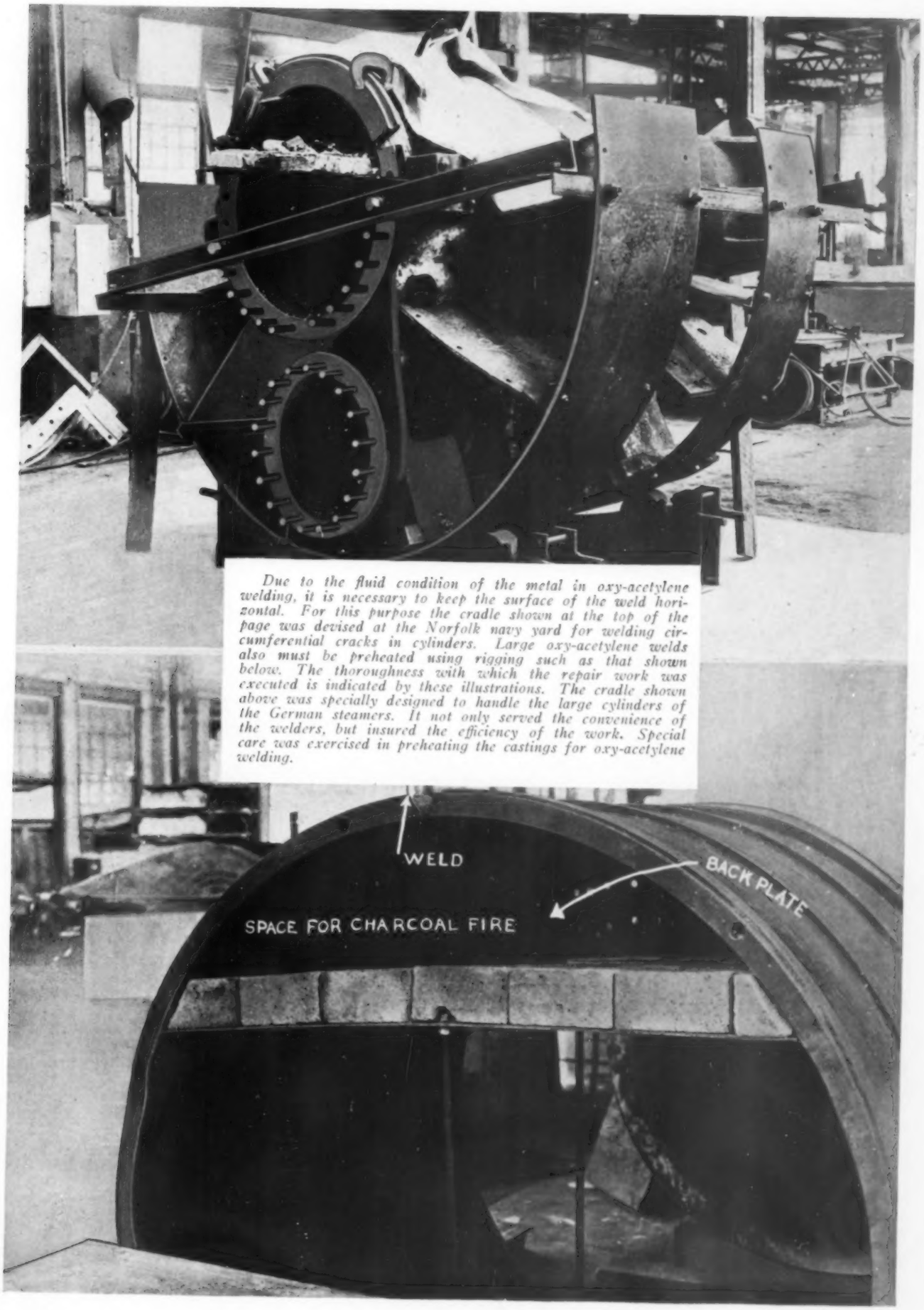
Many other smart tricks were tried, but none succeeded in causing any damage. In some cases small pipes were uncoupled, plugged and screwed together again, to all external appearances in good order. Occasionally check valves were reversed—a simple operation effected quickly by uncoupling the valve and turning it over. On the giant VATERLAND, now the U. S. S. LEVIATHAN, a section of suction pipe to the fire and bilge pumps was found with holes bored in it. The holes had been plugged with putty and red lead and then covered so they would not be discovered. On the KAISER WILHELM II the intermediate piston rod on each engine was badly bent, but not so badly as to preclude its being straightened. On another vessel, the piston and connecting rods were sawed part way through and the saw cuts concealed. In still other cases, staybolts were sawed in two and replaced so they appeared to be in good order. Staybolts also were cut off just outside the plate, so the nuts held only by one thread. The broken ends of the bolts were screwed into the nuts to give the appearance of normal solidity.



GERMAN AUXILIARY CRUISER PRINCE EITEL FRIEDRICH SIEZED BY UNCLE SAM AND NOW IN THE U. S. NAVY

Steam valves were gagged and the indicators tampered with, so that in the case of some large valves, when the indicator showed "open", the valve was merely cracked. On a few ships dynamo connections were tampered with, gratings and runways were smashed and the engine-room telegraphs altered.

In the case of one ship the work of repair was completed and the vessel sent out for trial. At low speed all went well. Immediately after the engine was thrown into full speed, a tremendous knocking



Due to the fluid condition of the metal in oxy-acetylene welding, it is necessary to keep the surface of the weld horizontal. For this purpose the cradle shown at the top of the page was devised at the Norfolk navy yard for welding circumferential cracks in cylinders. Large oxy-acetylene welds also must be preheated using rigging such as that shown below. The thoroughness with which the repair work was executed is indicated by these illustrations. The cradle shown above was specially designed to handle the large cylinders of the German steamers. It not only served the convenience of the welders, but insured the efficiency of the work. Special care was exercised in preheating the castings for oxy-acetylene welding.

developed in one cylinder. The engine was shut down and the cylinder cover removed. A large machinist's hammer was discovered. It had been concealed in one of the steam ports and at low speed the steam velocity was insufficient to blow it out into the cylinder. At high speed it might easly have broken the cylinder head.

* * *

SUCH was the situation when American engineers and naval officers took up the problem of repairing the damage and placing the German ships once more in commission. Not only were cylinders and other vital parts smashed, but "strategy" such as that just outlined had been resorted to to delay and, if possible, prevent the use of the ships by American forces at any early date.

the German reckoned without his host. In this case all of the parts so carefully enumerated were repaired and no new castings were required.

In general, the problem of getting the German boats back into commission divided itself into two parts. First, it was necessary to ferret out and repair all the vandalism. At the same time each ship had to be completely refitted and overhauled to eradicate the effect of three years' idleness and neglect. Many of the boats were found to be in bad shap due simply to natural deterioration. Once more Prussian efficiency was found to have been asleep at the switch, and on most of the ships the work of refitting and overhauling actually required more effort than repairing the actual damage.

While the ships were being overhauled, their obvious engineering deficiencies, which had been revealed by surveys, were remedied. The boats were found to be far from the paragons of perfection that the continued advertising of German efficiency would lead one to believe. The great VATERLAND, for instance, although equipped with steam lines which in some cases extend over 300 feet, was almost totally unprovided with steam traps, and the few drains that were fitted were arranged to discharge into the bilge. The boilers of the VATERLAND were not fitted with internal feed pipes, and therefore primed very easily. Her turbines were faulty. The casings were subject to heat cracks, and on the last voyage across, the great vessel made the trip on three propellers at reduced speed. Plenty of other evidence was discovered on the internal vessels to prove that ordinary German engineering practice does not measure up to American standards.

In nearly every case the broken castings, including

A Few of the Former German Liners With Their New American Names

German Name	American Name	German Name	American Name
Adamsturm	Actaeon	Hermes	Hermes
Allemannia	Owasco	Hohenfelds	Long Beach
Amerika	America	Holsatia	Tippecanoe
Andromeda	Bath	Indra	Tonawanda
Arnallas Vinnon	Chillicothe	Kaiser Wilhelm II	Agamemnon
Barbarossa	Mercury	Kiel	Camden
Bochum	Montpelier	Koenig Wilhelm II	Madawaska
Bohemia	Artemis	Koln	Amphion
Borneo	Nipsic	Kronprinz Wilhelm	Von Steuben
Breslau	Bridgeport	Kronprinzessen Cecilie	Mount Vernon
Carl Diederichsen	Raritan	Leibenfels	Houston
Clara Jebsen	Tioga	Locksun	Gulfport
Cincinnati	Covington	Neckar	Antigone
Coblenz	Sachem	Nicaria	Pensacola
Darvel	Wamsutta	Odenwald	Newport News
Dobek	Monongahela	O. J. D. Ahlers	Monticello
Elmshown	Casco	Pommern	Rappahannock
Elsass	Appelas	President	Kittery
Esslingen	Nyanza	Praesident Grant	President Grant
Farn Gerraux	Farn Gerraux	Praesident Lincoln	President Lincoln
Frieda Leonhart	Astoria	Prinzess Irene	Pocahontas
Friedrich der Grosse	Huron	Prinz Eitel Friedrich	De Kalb
Geier	Schurz	Rhein	Susquehanna
George Washington	George Washington	Rudolph Blumberg	Beaufort
Gouverneur Jaeschke	Watoga	Saxonia	Savannah
Grosser Kurfurst	Aeolus	Staatssekraetar Solf	Samoa
Grunewald	Gen. George W. Goethals	Vaterland	Leviathan
Hamburg	Powhatan	Vogenson	Quincy
Harburg	Pawnee	Willehad	Iroquois

On one German ship on the Pacific the work of destruction seemed so successful to the captain and chief engineer that they took the trouble to prepare a detailed list of the damage for future reference, carefully noting the parts that in their judgment had been wrecked beyond repair. A portion of this list, literally translated, follows:

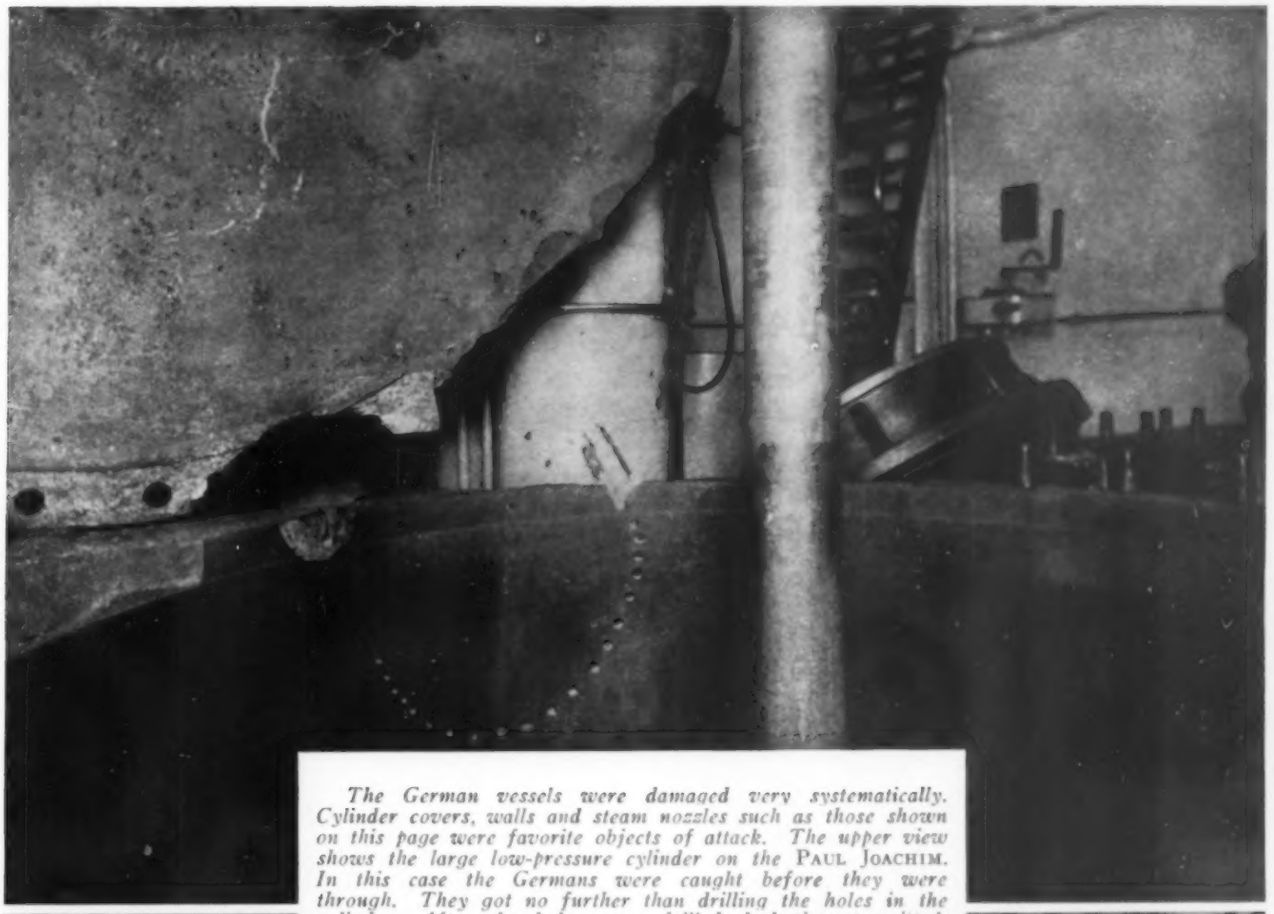
1.—Starboard and port high-pressure cylinder with valve chest; upper exhaust outlet flange broken off. Cannot be repaired.

2.—Starboard and port second intermediate-pressure valve chest; steam inlet flange broken off. Cannot be repaired.

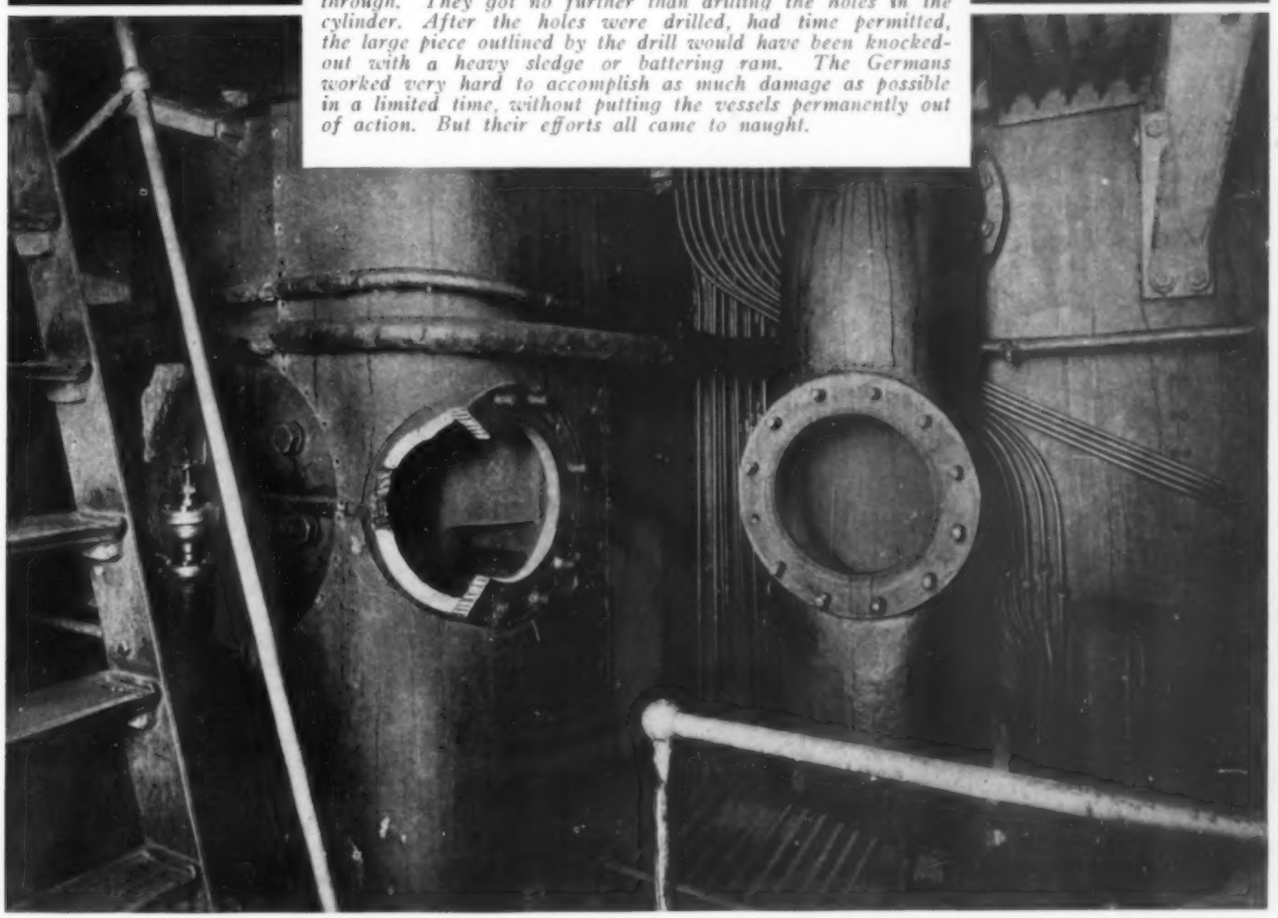
3.—First intermediate-pressure starboard; exhaust pipe of exhaust line to second intermediate-pressure, flange broken off. Cannot be repaired.

4.—Starboard and port low-pressure exhaust pipe damaged. Cannot be repaired.

But as we stated in the introduction to this article,



The German vessels were damaged very systematically. Cylinder covers, walls and steam nozzles such as those shown on this page were favorite objects of attack. The upper view shows the large low-pressure cylinder on the PAUL JOACHIM. *In this case the Germans were caught before they were through. They got no further than drilling the holes in the cylinder. After the holes were drilled, had time permitted, the large piece outlined by the drill would have been knocked-out with a heavy sledge or battering ram. The Germans worked very hard to accomplish as much damage as possible in a limited time, without putting the vessels permanently out of action. But their efforts all came to naught.*



cylinders, cylinder liners, valve chests, pump casings, steam nozzles, etc., were repaired either by oxy-acetylene or electric welding. A few mechanical patches were applied. In some cases steam nozzles were renewed by screwing in new parts with a fine thread. Electric welding was used in a majority of the cases. All of the 31 vessels in New York harbor were repaired by this method. Great credit for the success of the work on these vessels should go to the welding crews and experts actually engaged in the work.

It was due to the fact that railroad experience in welding broken parts was drawn upon freely that the work was executed with such effectiveness and dispatch. To the engineer familiar with modern welding practice in railroad and industrial establishments, the work on the German liners presents no novel features. No new principles were applied or untried methods attempted. In fact, the unusual success attending the entire effort rests largely on the fact that only time tested methods were applied.

The instructions of the navy department were broad; thoroughness, and satisfactory results were the principal factors insisted upon. The orders of the general officer in charge of the work contained the following injunction: "Nothing should be taken for granted. Examine every piece of machinery and piping carefully. Work only by the process of elimination, in order that no vandalism may be overlooked."

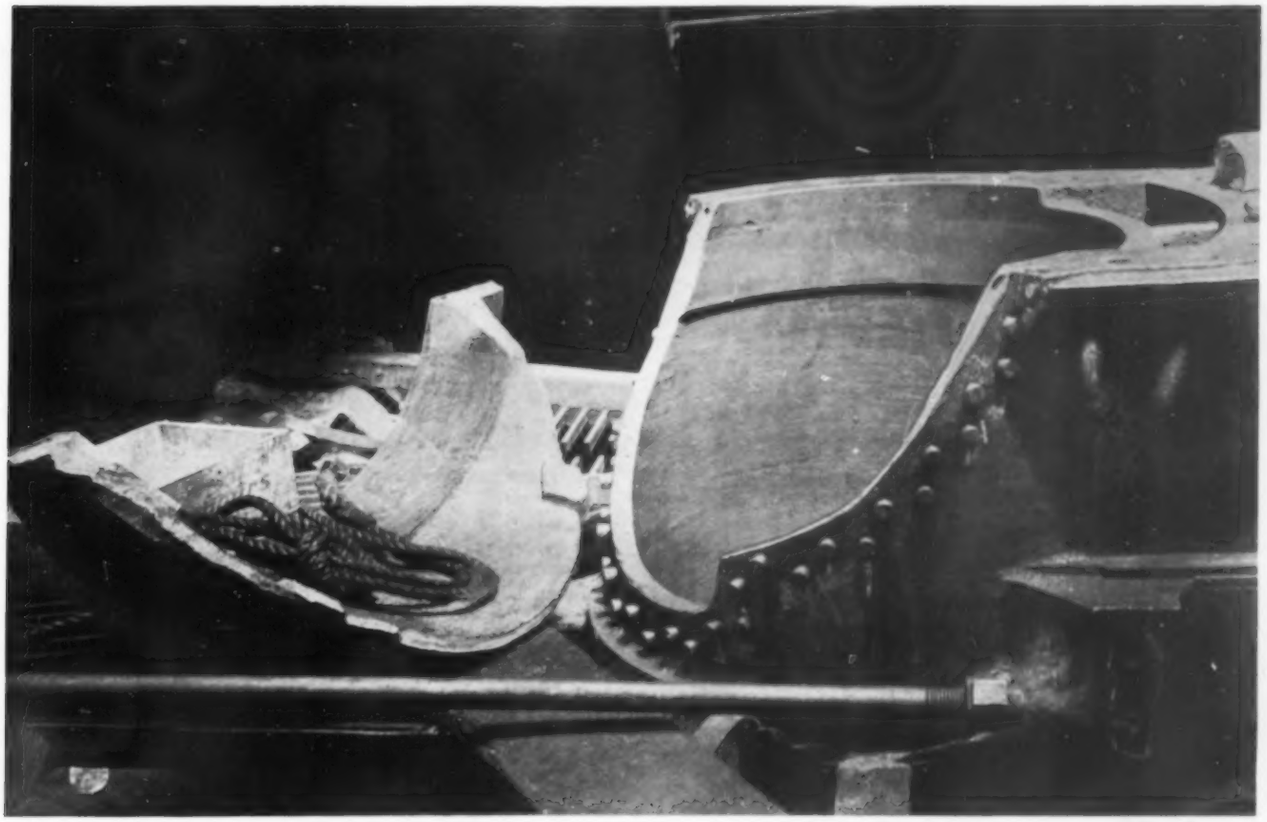
This is a particularly difficult electric weld. The method of anchoring the weld to studs and the cord-like structure are clearly visible. This weld was tested four times before passed as tight. In every case the leak was between the welded metal and the cast-iron cylinder wall. No leaks showed where the welded metal joined the cast-steel patch.

In preparing the electric welds, standard railroad practice was followed. Since the broken parts had been thrown overboard, it was first necessary to make castings to replace these pieces. This required a careful survey of each boat, followed by the preparation of drawings and patterns. The new pieces usually were cast out of steel, because steel welds most readily to cast iron by the electric process. The edges of the welds were chamfered in the usual manner. In most cases 7/8-inch steel studs were screwed into the unbroken portion of the casting, along the line of the break so as to form an anchorage for the welding metal. The welds were filled gradually and carefully peened and caulked as the work proceeded. Air caulking was an important part of the process as it served not only to densify the metal, but to close up porous spots and locate brittle sections, which were always cut out and refilled.

As a result of the capable manner in which the welding problems on these boats were handled, some startling economies of time and money were realized. It was estimated that new cylinder castings for the GEORGE WASHINGTON would cost $65,000. The broken parts were actually welded electrically for $15,000. What is even more important, six months time was saved. To replace two broken cylinders on another boat it was estimated an expenditure of $32,000 would be required, together with 10 to 12 months time. The damage was repaired by electric welding in 52 hours at a cost of $2600.

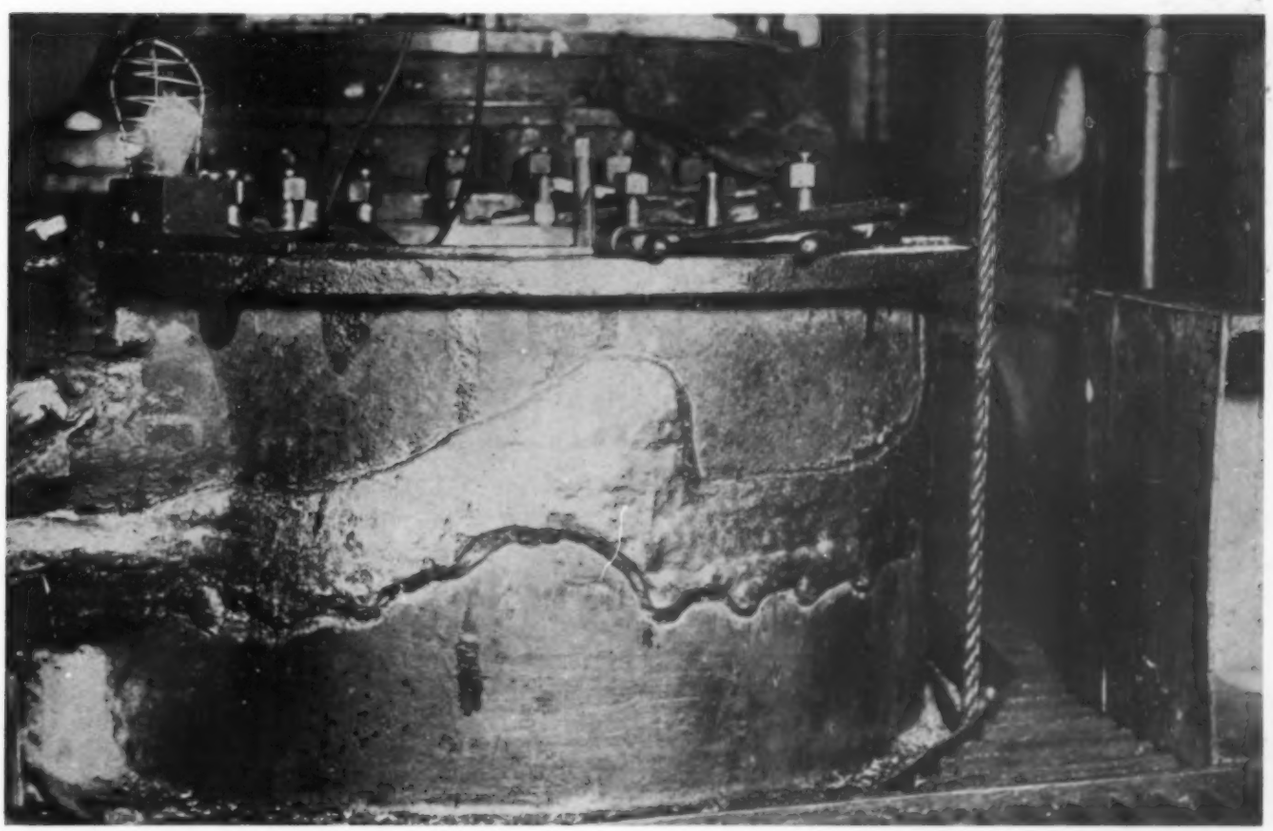
Equally startling and satisfactory results were secured from the oxy-acetylene process. Some details of this phase of the work were included in a paper on oxy-acetylene welding presented at the Boston meeting of the American Foundrymen's association by Stuart Plumley and published in THE IRON TRADE REVIEW, Nov. 22, 1917. Most of the oxy-acetylene welding was performed at the Norfolk navy yard. The cylinders were removed from the boats and taken to the shops where the work could proceed expeditiously. The usual preheating methods were followed. All of the welds were tight and no trouble has developed. Steel anchorage studs, such as were employed for the electrically welded cylinders, were not utilized. Also the broken parts were replaced by cast-iron instead of steel pieces, since by the oxy-acetylene process it is practicable to weld two cast-iron surfaces, using a cast-iron filling rod.

Such are the outlines of the great contest between Prussian vandalism and American constructive genius. The Germans played, and lost. Today our merchant marine and transport service is just 109 ships to the good. These vessels have been reclaimed from the jaws of the Prussian monster and set to work for humanity and freedom. Their aggregate tonnage is nearly 700,000. They are serving the nation in its war for democracy. Best of all, virtually every one of these boats is today a better all around steamship that it ever was under the German flag. Such is true efficiency.

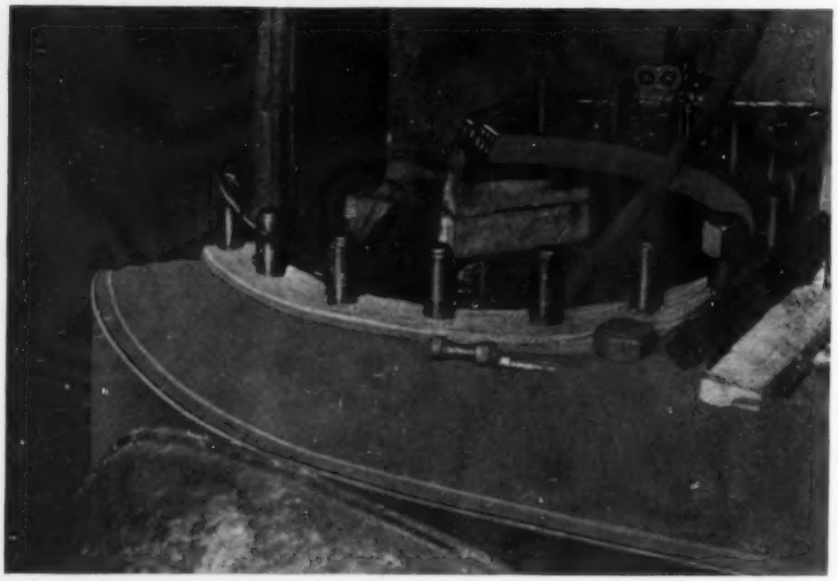


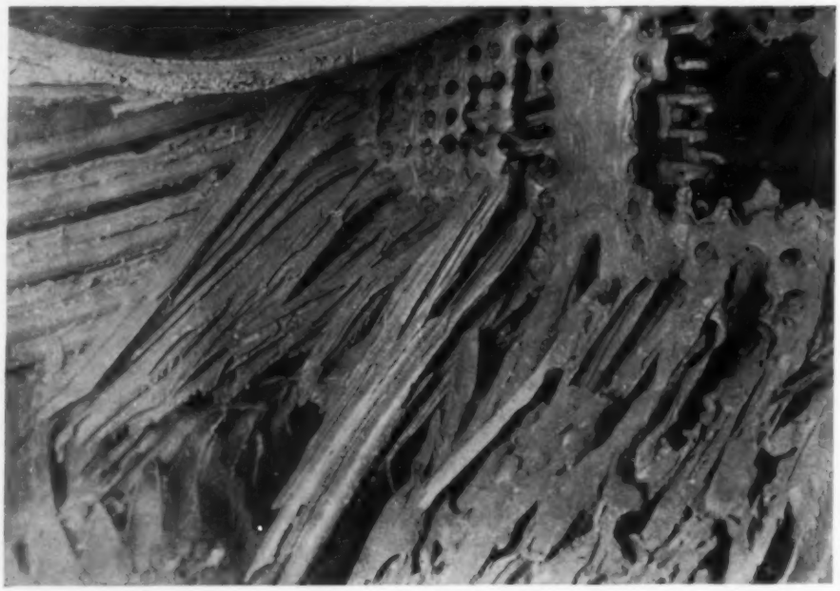
AN UGLY BREAK IN THE HIGH-PRESSURE VALVE CHEST OF THE PRINCESS IRENE

This illustration, and the one below, show in an unusually graphic manner the difficulties the welding engineers had to contend with. Their success was due to their skill and persistence. No chances were taken. Where it was necessary to refinish cylinders on the inside they were either rebored in the shop or ground with a special portable rig.



A COMPLETED ELECTRIC WELD ON THE FIRST INTERMEDIATE CYLINDER OF THE IRENE





A National Triumph

Scores of magnificent vessels such as those shown at the top of this page were gutted by their vicious German masters in their mad rage against America. The two views at the left are typical of the havoc and destruction wrought by berserker Prussians. But all their labor went for naught. American constructive genius was fully equal to the task of repairing the wastage of Prussian barbarism. Every former German ship seized at the outbreak of the war is now in service under the stars and stripes.

How We Can Help Russia—Today

A Suggestion for American Exporters and Manufacturers Interested in Building for the Long Future in the New Republic of the Eastern World —Start an American Counter Propaganda

BY THOMAS H. UZZELL

WHILE Russia is discussing with machine guns the form her new government is to take, it is idle to attempt to state which argument will prevail. Another Czar, a republic, a happy hunting ground for anarchists—nobody knows which it will be. At this writing Kerensky, the sentimental hero of the first days of celebration, has orated himself into oblivion; the communistic *Bolsheviki* ("Majority-ites"), recruited from Siberian prisons and New York's slums, are in possession of Petrograd, wondering what to do with it now they've got it; the army is hot-footing it for home, mother and freedom; educated folks from discreet hiding places are peering into the street, surprised and gratified that no bullets have yet penetrated their persons; the "savage Cossacks, whose sole trade is fighting", have seized the Donetz mining lands of the south, the richest region in Russia, and are organizing them for rapid output; while the old bureaucrats and monarchists, robbed of everything they ever possessed, are encouraging the *Bolsheviki* socialists to raise the devil as much as possible in order that they, the monarchists, may ultimately be called upon to wield the imperial big stick in the interest of law and order.

Impossible to Exaggerate

This diagnosis may seem facetious, unsympathetic; but to exaggerate the chaos in Russia today is impossible; and the present writer's faith in Russia, which he knows from personal experience, is unqualified. The cabled news from Muscovy is history turned comic opera. It would be ridiculous to expound it seriously. Upon one thing only all authorities in Russia are agreed: the fur is flying for democracy; out of the present bedlam some form of republican government is certain to emerge. Great has been the fall of the Romanoffs.

Russia will be democratic. The German kaiser is the one person who could restore the old dynasty; but before this war is over that gentleman will have been attended to. After this war no Metternich will be allowed to arise, as the famous original did after the Napoleonic era, to hand revolutionary Europe back into the hands of sceptered royalists. The United States herself is now earning the right and assembling the power to see to that. The Russian revolution, moreover, is one of the greatest educational campaigns the world has ever witnessed; the Little Father's former subjects have been "put wise". At heart the Slav is democratic, fraternal, a compassionate lover of justice. Because he is also idealistic, prone to fly to extremes, deficient in personal self-control, his new freedom will encounter many set-backs; many turbulent years will ensue before he will have achieved anything like a smooth-running government which will neither stall nor explode all over the premises.

What the Russian revolution will mean to the rest of the world, particularly to the United States, one can also only guess at. Our chief interest in Russia, like our chief interest in South America and China, is commercial; and the effect of the political somersault across the Pacific on Russian-American relations is undeniably great. I have been asked to write of this effect, particularly as it may interest the iron and steel industry of this country. Regarding the future I can only speculate. Certain things, however, any student of Russian affairs can say with confidence, and I set these down for what they are worth.

Russia failed in the war for the same reasons that she failed as a nation: the corruption of the bureaucrats who purported to govern her, bad tools, the ignorance of her people. The first of these weaknesses was really the cause of the other two. In order to insure their existence the bureaucratics fastened ignorance upon the people, and, being ignorant, without technical training, her workmen could not make good machinery, sufficient guns or ammunition. Russia's historic crime has been her government. It is impossible to understand what the future holds forth without comprehending what Russia's former government was.

The Imperial Looting Co.

A proper title for it would have been: The Russian Imperial Looting Co., Divinely Inc. Like Tammany, old Gomez of Cuba, and Wilhelm of Germany, it was in the governing business because it paid. Economics explains nearly everything, even kings. The czar, backed by his cabinet and court, formed the most colossal enterprise for commercial exploitation the world has ever seen. The imperial leech fastened itself upon the largest and potentially richest country in the world, sucked its life blood from it and gave it very little in return.

The czar was the richest man in the world. No man living could exactly estimate his wealth, but it has been estimated variously at from 10 to 30 billions. In his own name he owned 150,000,000 acres of land, including magnificent forests, colossal

Thomas H. Uzzell

The author of this article is a student of Russian affairs who has had an unusual opportunity to study the now moribund colossus of the east at first hand. He spent three years in Russia prior to the war, during which period his travels and consequent observations were unusually extensive. His position as a writer of experience and a broad student of the economic development of peoples, lends unusual weight to his clear analysis of the situation and to his ringing appeal for an intelligent, organized American business propaganda in the land of revolutions and surprises.

mines and agricultural terrain enough to feed a nation of people. His salary was said to be $10,000,000 a year. In his service were some hundred palaces and royal residences, 30,000 servants, 300 automobiles, 5000 horses, and a small army of soldiers and secret service men. Mr. Romanoff in the good old days was in no danger of suffering from the cold in winter or the heat in summer.

The revolution has destroyed the bureaucratic leech. Hereafter all this wealth will be made available to her people and to the world. Think what this means in business development! I am aware that apologists of the old regime argue that it maintained internal order, that railroads, schools, factories had increased during the last half century; but I contend that peace of the autocratic, Romanoff sort is peace at too dear a price, that practically all the other advances achieved were made either to increase its own wealth, to entrench itself further within its own defenses, or indeed were granted, like Christmas gifts, the sort the German kaiser is accustomed to allow, to quiet the clamorous cries of the people.

Under the old order there was only one important business in Russia, the czar's. That modern shibboleth, "Does it pay?" supposed to belong peculiarly to the United States, was asked by Russian officialdom with princely effect. The forests of Siebria, the mines, the deserts of Turkestan, the popular booze, vodka, the banks, the army, the church, concessions to foreigners, the Red Cross, political exiles—everything, everybody, was made to contribute a proper dole to the imperial exploiters.

You wished to start a steel warehouse in Petrograd. You must see Count X., who owns the building you must rent. His terms include a neat royalty on your earnings. You decide to build your own building. It can't be done; there are laws against it, laws passed by Count X.'s friends on the mayor's council. You wish to start a mine. You find that your richest lode runs into some crown land which is absolutely unpurchaseable. Or, the railroad you must use is a government road; your car supply is left to the whim of incompetent, irresponsible officials; you are at their mercy. Perhaps you desire only to start a temperance fund. See her majesty the czarina. She handles all the money for such things.

So it went. In innumerable ways normal industrial development was stifled and foreign investments were discouraged. Some foreign enterprises, to be sure, were established and were succeeding, but they were more diplomatic than commercial successes. They certainy were not founded on Yankee lines. I knew one American business man in Russia the representative of one of the best known firms in the United States, who became so successful and so involved in "diplomacy" that he had to flee the country, leaving his family to represent him in the bankruptcy tangle he left in the courts.

With the passing of the old bureaucratic hierarchy of exploiters, I think one may reasonably prophesy the rapid disappearance of that whole train of social and economic archaisms which it caused and which militated against industrial advance: unscientific tariffs, lack of co-operative banks, confiscation of property without due process, bribery, trade licenses, crown lands, excessively long credit, religious and dynastic holidays (one-third of the calendar formerly being lay-off days), illiteracy, debts to middlemen, scarcity of fuel and railways. After the war American investors and exporters may expect a new commercial treaty with Russia to take the place of the treaty of 1832 which was not renewed in 1912 on account of the treatment accorded Jews with United States passports in Russia. The preferential tariffs formerly existing in favor of German merchandise will undoubtedly be removed.

Aside from these social and economic factors, there are political considerations which brighten the prospect for future trade with Russia. The United States was the first nation officially to recognize the new provisional government. There has never been any commercial jealousy in Russia against Americans as there has long been against Germans. Before the war the energy, the genius, the merchandise of Americans were welcomed and admired in Russia more than the qualities or products of any other foreigners. During the war of 1812 Alexander the First interceded actively with England in our behalf. During the civil war Russia, having liberated her serfs in 1861, stood for the Union against slavery and sent two fleets to this country to attest her friendliness. There is historic

Cossacks to the Rescue

WITHIN the past few weeks the Cossack revolt in southern Russia has assumed extraordinary proportions. The Cossack leaders, Generals Kaledines, Korniloff and Dutoff, have secured the support of all the antiextremist, prowar factions in Russia and the sympathy of the entire allied world. The recently-seceded Ukranian republic, the Provisional government of Siberia, the Knights of St. George, representing peasants controlling 80,000,000 acres, much of Little Russia and Turkestan have all apparently rallied to their cause. They thus control both the industrial and food-producing regions of Russia. The Bolshevists complain that millions in money have been furnished the Cossacks by allied sympathizers. Civil war has been begun. Reports are now arriving daily of clashes at Moscow and other places in middle Russia. It seems probable, however, that only starvation, not fighting, will cause the Bolsheviki to capitulate. The latter still control the Siberian railroad, although an unconfirmed rumor states that the Japanese are ready to assume control of the immense store of supplies at Vladivostok, the eastern terminal. If the threatened colossal drive of the Germans in the west should materialize, the fate of the world may rest with this starvation campaign of Russia's revolting Cossacks.

Russian Scholarships

A PLAN for instituting Russian scholarships in this country has just been laid before authorities in Washington by an American worker in Russia. American export firms are to pay the college tuition for carefully selected Russians in return for a given number of years' service in Russia after their education shall have been completed. No effort will be made to launch the scheme, however, until the war crisis shall have passed.

The immediate need for social and political propaganda in Russia cannot be exaggerated. The Y. M. C. A. in connection with its splendid service in establishing religious and recreative centers in the countries of our allies, now has some 300 men in Russia engaged in much the same work. It is even planning to extend Russia educational assistance in the same way. The government, through the committee on public information, also is gathering its forces. But where is American business? If American business is to share in Russia's coming prosperity, if American business wishes to assist the government win the war, American business should help —advertise in Russia!

PETROGRAD—RUSSIA'S NERVE CENTER

precedent for deep friendliness bebetween the Russian and American peoples.

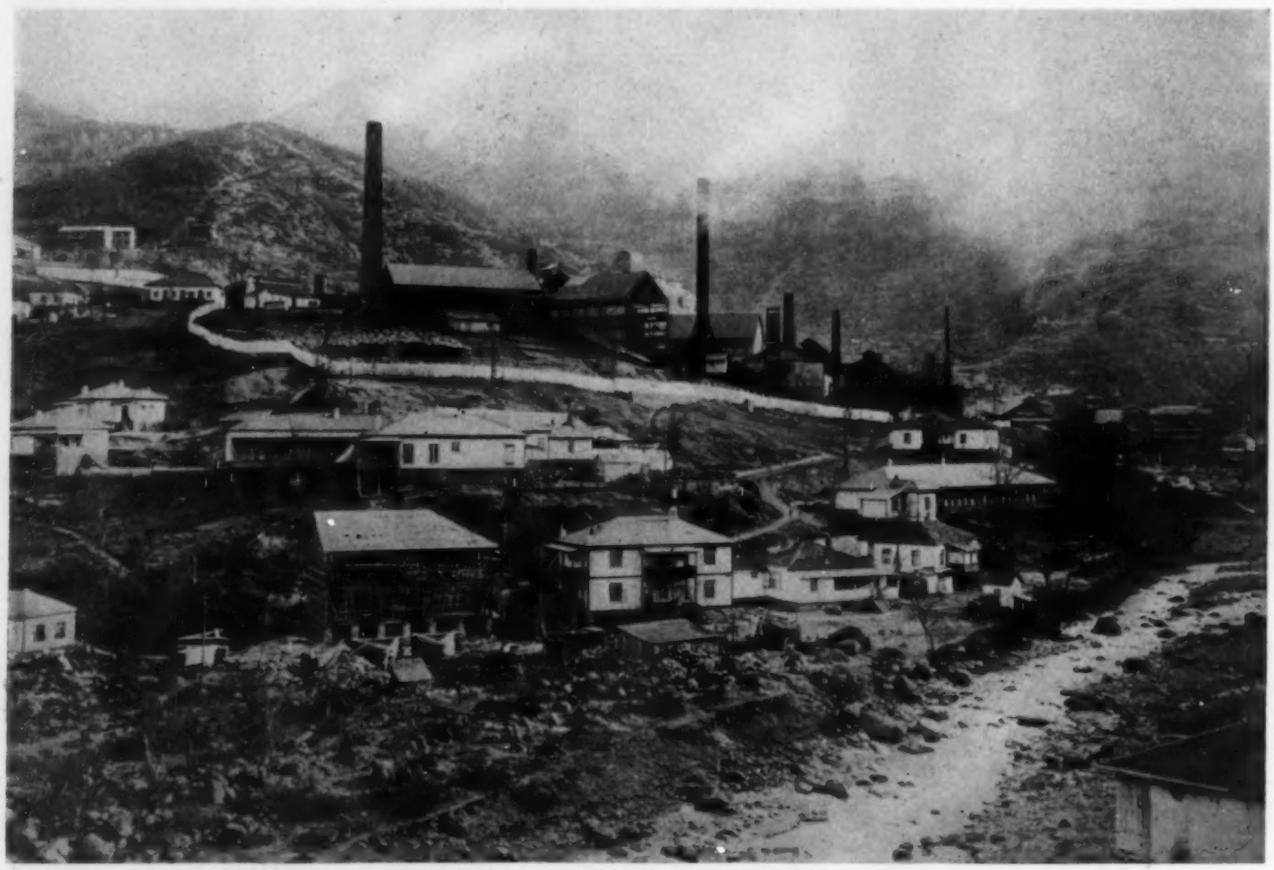
Americans love Russian art; Russians admire American inventiveness and enterprise. Russians are vastly curious about American habits and American achievements. In one of Petrograd's street bazaars during the Russian pre-Easter week of fasting ("Pussywillow Week" it is called) I once heard a peasant barker at a booth crying his wares: "American citizens for sale!" I bought one and it turned out to be a little effigy which bobbed up and down rapidly in a glass tube, thus illustrating American energy! The old fellow was selling us at 10 cents apiece. Another time I was sitting, cross-legged beside a native Mohammedan merchant in front of a mosque in Russian Bokhara, Turkestan. While drinking in the color and oriental picturesqueness of the scene and questioning the merchant as to what the mullah was droning from the minaret over our heads, I was suddenly interrupted by the query: "How can I buy an American gas engine?" Any traveler in Russia can multiply such instances indefinitely.

Russia's material resources and her capacity as a future buyer are illimitable. She is the chief commercial seedling of the world. The "land of unlimited possibilities and unfathomable mysteries" has become the promised land of the investor of tomorrow. Her territory, comprising one-sixth of the land surface of the earth, is more than twice that of the United States and exceeds that of any other country. Her population, nearly twice ours, is equal to that of Britain, France, Germany and Austria-Hungary combined and is increasing at the rate of 3,000,000 a year.

Commercially, Russia's present condition is comparable to that of the United States after the civil war. Industrially, she is passing from the age of handicraft to the age of machinery, from the age of fairs and barter to the age of capital and credit. For that reason American genius for extensive industrial development rather than the intensive methods practiced in Europe should find there a peculiarly happy field of occupation. Siberia alone, in spite of its grewsome reputation as a land of exile, is a vast new virgin west waiting the coming of pioneers. In order to people and hold this empire of opportunity the old government appropriated $12,875,000 annually, this sum to be expended in encouraging emigration thither. Three million peasants have already applied for free homesteads and hundreds of thousands have been working as day laborers in western Siberia, awaiting their allotments. To date the authorities have not been able to cope with the situation.

A commission of the Academy of Sciences in Petrograd is now engaged in determining and estimating Russia's vast natural resources, and it is hoped that before very long several volumes containing the results of their inestigations will be available. Russia's continental plains or steppes, enormous mountain ridges, extensive wooded tracts, rivers thousands of miles long, contain an abundance of everything that constitutes primitive wealth. Most of it is in the temperate zone. Professor V. I. Vernadsky, the noted Russian scientist who heads the commission referred to above, states that of the 61 chemical elements utilized by man, 31 have already been found in Russia in combinations that permit of their extraction.

Although her agriculture, judged by modern standards, is still in a crude state of development, she nevertheless is one of the largest producers of rye, wheat, oats and sugar beets. She exports more wheat than the



A RUSSIAN MINING CENTER

United States. While she cultivates only 250,000,000 acres of land, half that cultivated in the United States, she has fully 5,000,000,000 acres of arable land as yet untouched. Her immense forests are nearly treble in size those of this country. Her resources in metals and coal have hardly been scratched. Although Russia has only 46,000 miles of railroad track as compared with 256,000 in this country and has outlined a program for the expenditure of over $300,000,000 for further construction within the next few years, she already boasts of the longest single line in the world.

Before the war, 16,600 annual fairs provided the chief means for the purchase and distribution of produce. One fair alone, that at Nizhni-Novgorod, yearly returned $75,000,000. Ten billion roubles, or half as many dollars, represented the total volume of commercial and industrial business in Russia in 1913. It is a foregone conclusion that, with the removal of the political brake on the economic development of the country, internal and especially foreign business will move forward on high gear. Russia's foreign trade, exports and imports, in the year 1913 had already reached 2,894,169,000 roubles.

Few commercial fields in Russia hold forth brighter prospects for rapid development than do those of iron, steel, coal and heavy machinery. Although rich deposits of iron and coal have been discovered and worked in European Russia, there are those who believe that still more valuable deposits are yet to be found in Siberia. Judged by the number of workers involved, the mining and metals industry in Russia is second in point of size, textiles being first and food production third. No other industry is more inadequate to the needs of the population. The annual production of pig iron is 0.03 ton per head, as compared with 0.11 in England and almost 0.33 in the United States. The total production of pig iron in 1916 was 4,174,000 net tons which is about two-thirds of the capacity of the existing mills. The price of pig iron rose from $15 in 1910 to $40 this year. In this connection it is interesting to note that before the war 13 per cent of Russia's imports were base metals and manufacturing machinery.

The three most important mining centers in Russia at the present time are located in South Russia along the river Don, in the Ural mountains and about Moscow. Of the total amount of pig iron output in 1916 the southern region produced 75 per cent, the Ural 21 per cent and the Moscow district 4 per cent. (The Polish iron belt which, in 1913, totaled 466,000 short tons and which is now in the hands of the Germans, is omitted from these calculations.) The production of iron and steel half-manufactured products amounted in 1916 to 4,696,000 short tons. Finished iron and steel products amounted to 3,706,000. The total number of employes in the metallurgical branches in 1916 was 427,502.

The Ural mountain region, the first to be worked, is still conducted on primitive methods. Wood is largely used for fuel and the ore and metals are transported by water down the Kama and other rivers. Since 1900 its output has declined. Here are to be found iron, coal, gold, copper, salt, precious stones and 96 per cent of the world's supply of platinum.

The real Pennsylvania of Russia is located in the south, in the provinces of Ekaterinsolav, Kherson, Tauride and the Don government, along the Don river. This Donetz basin, as it is called, is larger in area than England and Ireland combined. Its potential virility is incalculable. Coal, bituminous and anthracite, iron ore, manganese, rock salt and many

MANGANESE ORE MINE IN RUSSIA

species of refractory earth are found there in abundance. Donetz anthracite is remarkably pure, containing 95 per cent carbon. One estimate places the deposits of both kinds of coal in the Donetz basin at 17 milliards of tons, 12 being anthracite.

Only Eight Steel Mills

In this region are 18 establishments with blast furnaces and eight steel mills. There are also foundries, sheet steel works, engineering shops, agriculture machinery works, etc., all conducted with modern appliances and scientific knowledge. The railways there use 1,320,000 cars. The water outlets are the Azov and Black seas. The capital involved in these works is mainly French and Belgian.

Notwithstanding Russia's wealth in minerals and metals of all kinds, and the endeavors made by the government to encourage mining, including the imposition of protective tariffs, one discriminating even against Finland, this and related industries are still in a low state of development. The remoteness of the mines from industrial centers, want of technical education and capital, vexatious regulations, aggravated by the disturbed condition of country are among the most serious causes which have hindered credit, confidence and enterprise in the Russian iron business. The latest cables from Petrograd declare that General Kaledines, the Cossack chieftain, has taken possession of the Donetz mining area and is endeavoring to operate it by means of industrial committees. This move is but one of the paradoxical pranks of revolutionary chaos. Ultimate foreign control of these mines is inevitable. Russia's need of capital to tide her through her coming epoch of economic awakening will bring this about, if nothing else will..

Whether or not the United States will play an important commercial or financial role in building up industrial Russia is problematical. That she should do so few will question. James A. Farrell, president of the United States Steel Corp., has declared: "We can no longer talk of foreign trade merely as an adjunct to domestic prosperity. There can be no stable prosperity at home unless we are able to make liberal sales of American manufactures abroad."

In mastering commercial Russia, there are difficulties, serious ones, to be overcome: The risks of political instability, the distance, lack of a merchant marine, Russia's lack of sea ports, ignorant labor and the language. Melodramatic descriptions of Muscovy have unfortunately given her a lurid reputation. Now she will become, we hope she will become, like us—without our faults. Statesmanlike vision, governmental co-operation, a sympathetic study of the Russian people as they really are, a voluminous interchange of commercial information, daring to accept necessary risks, much traveling, much language study—these are some of the prices which we will have to pay to hold our own in Russia with England, France and Germany.

Before the war Russia did 34 per cent of her foreign marketing in Germany, 15½ per cent in the United Kingdom and only 9½ per cent in the United States. Germany's Russian trade is ours if we will take it. Taking it will not be a race to the Yukon; it will be cultivating pleasant fields whose yield will be astonishing.

Cultivating Russian Trade

Our promoters and salesmen will have to learn that the prevailing color of Russia is not the red of the revolutionists nor the yellow of the sensation-mongers, but rather white (golden, if you will), white unto the harvest with a quiet tinge of gray, representing the melancholy moodiness of her people. They will have to learn a language as difficult as Greek or Latin. They will have to learn to pronounce *Kupecheskaya Uprava* (board of trade) and understand its control of Russian business. They will have to strive not to fall dead when their Russian friends say *arshine* instead of *yard* and *funt* instead of *pound*. They will have to drink tea, keep late hours, accept hospitality. Mr. Kupetz (*kupetz*, merchant), being inordinately proud of his table, may attempt to get at them through their stomachs, but they will get at him only through his heart. They may wax eloquent about their windmills and motor trucks, but he will want to know why we lynch our negroes. Why doesn't Russian capital circulate? They will have to learn that. A Russian merchant smiles when an American says, "Money talks." To fathom that smile will be an interesting and important study in race psychology. For a time at least our commercial pathfinders in Russia will have to cultivate much patience—and learn to wait.

Wanted—An American Propaganda

Of all the many things to be done to make the dollar popular in Russia, I wish, in closing, to speak specifically of only one. I believe its importance is overlooked. To make the dollar popular we must make the American popular. He has been popular; we must keep him so. Nothing in all the history of the two peoples has done as much to embarrass possible future trade relations as the malicious anti-American propaganda disseminated in Russia by the thousands of Russian socialists and other political exiles who returned to Russia from this country after the outbreak of the revolution. The commissioners sent to Russia by President Wilson had much to say on this point on their return. These disgruntled radicals, some of whom now form the "government" in Petrograd, one of whom carries the title of foreign minister, freely malign the United States as a country of exploiting capitalists, slave-driving bosses, money-mad freaks of nature.

Business Follows Propaganda

Germany has learned and has shown the world that it pays a nation to advertise. In the winning of some of her victories a basket of leaflets has been worth more than a field gun. A large part of her propaganda admittedly is treacherous. There is, however, an honest and friendly sort of propaganda, just as there is an honest and useful brand of advertising. Little in a commercial way can be done in Russia now; but we can advertise. We can see that the United States is fairly represented to the wakening intelligences of Russia's millions. Our consular and diplomatic service is not enough. Now is the time to begin. Business follows propaganda. It is the first law of the decalog of the new age. Before the war German agents were invading Russia at the rate of 50,000 a year. It is expensive; you may think our goods should speak for themselves. You are wrong. Like it or not, that is the way to win Ivan!

If the present administration of this country were thoroughly in earnest in its announced willingness to assist foreign commercial conquests, it would do something more than modify the maritime laws so as to secure the development of American shipping, than extend the federal reserve act to further facilitate the establishing of banks in foreign countries, than amend the antitrust act to permit the co-operation and union of American firms striving for export business; it would itself send or encourage big business interests to send another small army of young men to Russia; and this army would learn the language, where they did not already know it; they would ask intelligent questions; they would tell the truth about the United States; they would be the advance patrols for a drive of American capital and enterprise which would be a satisfaction to both countries and an economic blessing to the world.

Reshaping Automotive Industries

How the Demands of Motorized Warfare Are Transferring the Energies of Automobile Manufacturers from the Production of Pleasure Cars to the Making of Battle Planes and Trucks

BY E. L. SHANER

MOTORS will win the war. On land or sea, or in the air, the victory which precipitates peace will be the outcome of motorized warfare. The crackling staccato of the army truck, patrol boat or airplane engine is as essentially a part of modern fighting as the rattle of the machine gun or the drum-fire of heavy artillery.

Three and a half years of conflict have conclusively demonstrated the importance of internal combustion motors. Crushing defeats administered by onrushing German armies twice have been turned to victories for the allies through the unfailing service of motor trucks. At sea, marine motors, driving scout patrol boats, trawlers, etc., have proved their worth in the constant vigil for submarines. As the power units of the air fleets, motors have contributed to a new style of warfare which bids fair to become a deciding factor in the final outcome of the struggle.

The story of Verdun has been told time and time again, but in few instances have the indispensable motor-truck fleets been given due credit. For five months, during the early part of 1916, the forces of the crown prince hammered at the gates of Verdun in the vain effort to continue their march to Paris. Throughout this trying period the ring of forts defending the city were fully 30 miles from the nearest railroad station. Most of the troops, supplies and munitions were carried in trucks over a single road connecting Verdun with Bar-Le-Duc, a town on the railroad from Paris to Nancy. During the long drawn out siege, thousands of trucks hurrying over this slender line of communication enabled France to repulse the enemy. The 34-mile road between Verdun and Bar-Le-Duc, part of which was continually under German fire, was divided into five districts, each in charge of a traffic manager. Trucks traveled in squads of five each, and under no circumstances were the formations allowed to be broken. Breakdowns were handled promptly and effectively. Unless the repairs to a disabled truck could be made in a few minutes, the truck was simply pushed from the road to allow the following transports to proceed. Trucks carried the belongings of the citizens of Verdun to the rear when that town was evacuated; they brought up the thousands of tons of ammunition to defend the town; carried fresh troops to the relief of those who needed rest; moved the wounded soldiers back to the hospitals; and in addition maintained a steady stream of food and supplies to the men at the front. Night and day the double line of trucks, always running at the uniform speed of 9½ miles per hour, administered to the needs of the defending army. At the end, when the forces of the crown prince were effectively repulsed, the world realized that France had triumphed. Motor trucks had saved the day.

At the battle of the Marne, motor vehicles also forestalled a great disaster. With the invading Huns almost within sight of the capital city, the military governor of Paris rushed thousands of troops in trucks and taxi cabs to the battle front. The augmented line of defense held, and again the relief of averted calamity spurred France to new efforts.

The development of the flying machine to its present state of reliability has an influence, the full importance of which is yet to be demonstrated. The activities of the air fleets of the various nations are demanding more attention from military critics as the war progresses, and there is a well grounded belief in many quarters that the conflict may be decided by aerial supremacy.

Commenting on the increasing impor-

Winning With Motors

THE tremendous tonnage of special and alloy steels required for the government's airplane and motor-truck program connects this phase of our war preparations vitally with the iron and steel industry. In this article, Mr. Shaner points out how our automobile industries are being reshaped and what this means to the steel maker. Within one great industry—the manufacture of automobiles—another is being created. The author, E. L. Shaner, formerly engineering editor of THE IRON TRADE REVIEW, *is now in the National army.*

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UNITED STATES ARMY PLANES DRAWN UP FOR INSPECTION AT AN AVIATION TRAINING CAMP

tance of aerial warfare, Lord Montagu of Beaulieu recently stated to a representative of the *New York World:*

* * *

"Man power is dwindling at different rates on all fronts except the Russian front, where it is temporarily disorganized, and it is inevitable, therefore, that Great Britain, France, Italy, Austria and Germany have for some time been turning to machine power and air power to make good the dimunition of human material. For the past two years we have seen examples of this tendency in the extended use of machine guns and artillery, and a still more notable instance now is the daily increase in the intensity of the air warfare, especially on the Flanders front.

"Two years ago air warfare rarely was mentioned in the official communiques. A year ago, there were accounts every two or three days of the deeds of our airmen, while today there hardly is an official communique from the British or French front which does not recount the varying fortunes of the air forces of the allies....We see, therefore, the greatest ingenuity and energy being displayed by all armies in an attempt to obtain air supremacy—that is, the power of keeping the enemy's aeroplanes from seeing what you are doing while you can see everything the enemy is doing.

"If this can be achieved, combined with continual bombing raids of destructive character upon lines of communication and troop centers, the side which obtains and keeps for a period this advantage is on the high road to victory, present and future."

Fighting in the air is the most spectacular kind of modern warfare. Airplanes are now used for at least four distinct purposes, and late official reports contain frequent references to each of these uses. The machines are employed for scouting and observation, fighting enemy aircraft, firing upon enemy's land troops and bombing enemy territory. It is impossible to guess how extensively aircraft will be used in the present war. "The War in the Air", the predictive story of German air supremacy written by H. G. Wells shortly before the war, was considered a fantasy only a few years ago. The bombing of London and New York, as told by Wells, seemed ridiculous, but history already has partially fulfilled his prophecy. Claims for the airplane which we now are inclined to take with a grain of salt, are likely to be substantiated at an early date. At any rate, past performances force us to look upon the airplane with respect in considering the possibilities of its future.

Inasmuch as motors have played such an important part in the war up to the present time and give promise of becoming more essential to success as the conflict continues, it is not strange the United States has embarked on a tremendous program of motor construction. Trucks and airplanes are to be turned out by thousands for the armies of the United States and its allies. Fortunately the industries of America lend themselves readily to this emergency.

A comparison of the relative capacity of the various warring powers in the manufacture of automotive machines is best obtained from the records of the automobile industry, as it existed before the war. Germany in 1911 had 56 automobile factories, with an annual aggregate output of 9368 cars. Of this number, 790 were commercial vehicles, the remainder consisting of pleasure cars. The United States in 1909 had 265 automobile plants which turned out a total of 126,570 cars. In 1914, the United States had 300 factories and produced 569,054 cars; and it is estimated during 1917 the factories in this country turned out 1,500,000 motor vehicles. Unfortunately Germany's production figures for 1917 are not available, but by allowing an increase from 1911 to 1917 proportionate to the actual increase in America's production from 1909 to 1917, the enemy's present production amounts to 111,000 cars. In 1912 the 12 automobile builders of Austria-Hungary produced only 400 cars. Therefore, allowing an almost impossible increase in production in the two principal central nations, the United States still has approximately a 10 to 1 advantage over her enemies.

As for the number of motor cars in use in the various countries, statistics recently published in the *New York Times Magazine* show that in the United States today there are seven times as many automobiles as were in use in the 10 leading European countries at the beginning of the war. The figures follow:

Year	Nation	Cars in use
1917	United States	3,512,996
1913	Austria	13,160
1913	Belgium	9,400
1913	Bulgaria	3,050
1913	France	98,400
1913	Germany	71,455
1913	Great Britain	276,690
1913	Italy	13,000
1913	Russia	15,360
1913	Serbia	120
1913	Turkey	525
1913	10 leading European belligerents	501,160

These figures are imposing, and if they indicated the true strength of the opposing nations in ability to move troops and supplies, the allies would have nothing to fear from the central powers. However, the European countries, despite their lack of capacity for automobiles, partially had overcome this handicap by making better use of their facilities. Germany was especially foresighted in this respect. Long before the war

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TUNING UP THE MOTOR IN ONE OF UNCLE SAM'S LATEST WAR PLANES (Passed by the Censor)

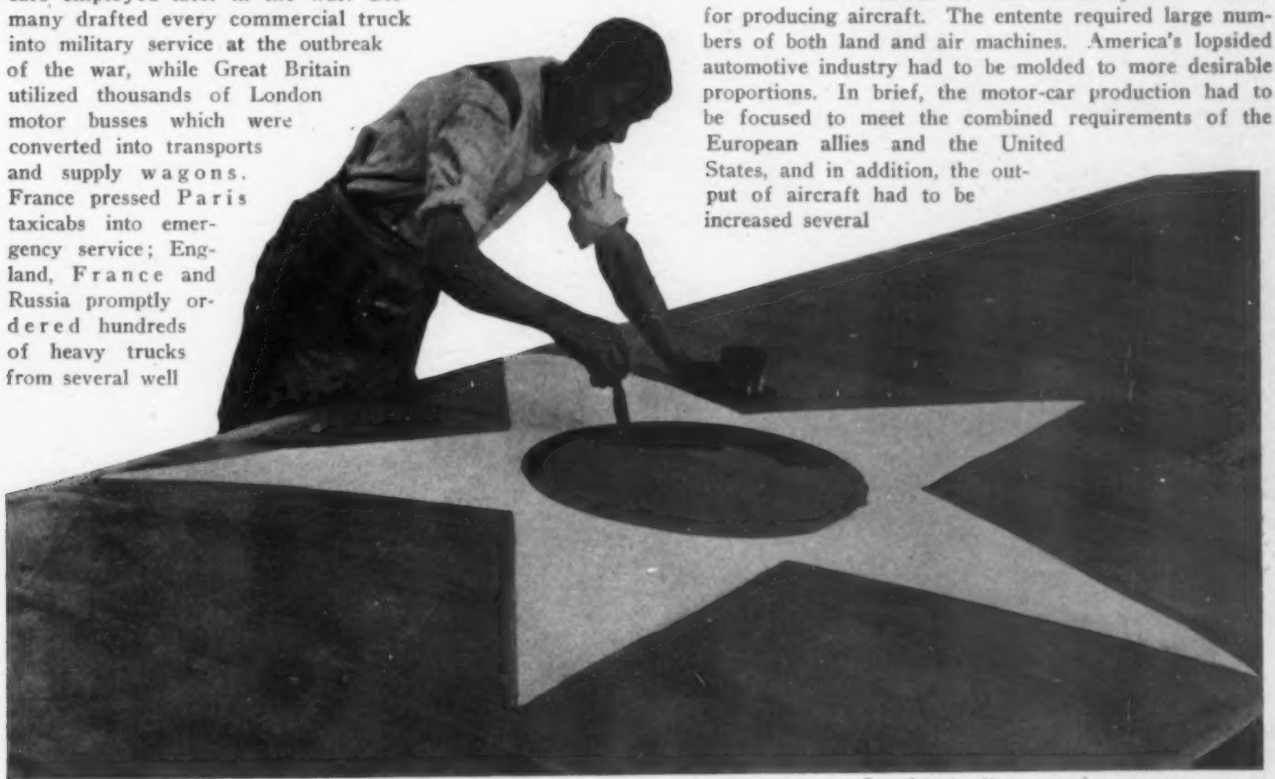
the government inaugurated a plan of subvention for industrial cars. Each factory building trucks of the required size, weight and capabilities furnished demonstration cars for the subvention trials of the German army. The subvention allotments were then distributed in accordance with the results of the trials, the largest orders going to those makers of cars which stood highest in the tests. This plan, or a similar one, was also employed by the other leading European powers previous to the war. It enabled each nation to promptly assemble large fleets of commandeered trucks, sufficiently standardized to form the nucleus for larger numbers of motor cars employed later in the war. Germany drafted every commercial truck into military service at the outbreak of the war, while Great Britain utilized thousands of London motor busses which were converted into transports and supply wagons. France pressed Paris taxicabs into emergency service; England, France and Russia promptly ordered hundreds of heavy trucks from several well known manufacturers in this country.

Up to the time the United States sent Pershing into Mexico to catch Villa, little attention had been paid to the forming of an adequate system of motor-truck transportation in our army. The government hurriedly rushed thousands of trucks to the border from a number of large truck manufacturing plants. The trucks were operated in squadrons, and in many cases drivers and mechanicians from the manufacturers were in charge of the fleets. The service these cars rendered on the stifling deserts of Mexico gave the army officials a wonderful demonstration of the importance of the motor car in war. Moreover, it emphasized the great advantage offered by standardization. Thanks to the elusiveness of the Mexican bandit and his nondescript army, which led Pershing 200 miles into the interior of Mexico, the United States had a considerable number of trucks when Von Bernstorff was given his passports. Had the nation been as fortunate in regard to airplanes, the industrial transformation of the automotive industry now in progress would have been unnecessary.

Whereas the United States was head and shoulders above the European powers in the production of motor-driven land machines, it was pitifully behind in the production of aircraft when the war clouds burst. In point of air machines in use, it was at even a more serious disadvantage. Just before the war, Great Britain was reported to have 250 airplanes available for military service, and critics were condemning the government for its lack of foresight in not providing a larger fleet. As nearly as could be estimated at the time, France had about 500 machines, which were well organized for instant action. Germany had at least 500 machines available, and Austria was in position to press about 150 planes into service when the crash came. Russia possessed about 170 machines and Italy was reputed to have about 150 "efficient" airplanes in 1914. Compared with these 650 machines owned by the central powers and the 1050 held by the entente allies, the United States had less than 100 planes in 1914. Whereas practically all of the European nations had well equipped plants for making airplanes, there were only a few aircraft factories in this country. The principal manufacturer, the Curtiss Aeroplane & Motor Corp., was just getting under way at Buffalo. Airplane building in the United States up to that time had been carried on in a limited manner, and production was at a deplorably low ebb.

Thus the situation in February, 1917, when the United States broke with Germany, was unique. The country possessed remarkable resources for making automobiles and trucks but lacked adequate facilities for producing aircraft. The entente required large numbers of both land and air machines. America's lopsided automotive industry had to be molded to more desirable proportions. In brief, the motor-car production had to be focused to meet the combined requirements of the European allies and the United States, and in addition, the output of aircraft had to be increased several hundredfold. This meant the transformation of one of the country's greatest industries, for it was early apparent that the automobile industry must carry much of the responsibility of providing for the aircraft program.

Fortunately, as pointed out by the *New York Times* in May, 1917, the automobile manufacturers were able, while caring for private demands, to produce 300 government trucks and 4000 passenger cars per day. The problem then resolved itself into one of standardizing the design of trucks to simplify repairs in France and speed up production in the United States, and to swing over to the aircraft industry a sufficient proportion of the automobile building resources to insure the success of a program of



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THE FIVE-POINTED STAR WITH THE ROUND RED CENTER IS THE EMBLEM OF AMERICA'S AIR FLEET

airplane production more extensive than anything ever attempted in any country. Simultaneous with the revamping of the motor car industry came the problem of increasing the output of the many airplane building plants which had sprung up during the past few years.

A Drawing Board Romance

One of the first steps necessary to place the production of aircraft on a firm basis was to design a standard airplane engine in order to simplify the problem of repair and maintenance. The perfection of this design, developed under the guidance and assistance of the aircraft production board, the war department and the bureau of standards, is considered as one of the big accomplishments of the United States since its entry into the war. The story of the production of the first engine, known as the "Liberty engine", is remarkable, and loses nothing in romance at the hand of the secretary of war, who announced the completion of the first engine. A few sentences from the secretary's interesting announcement indicate the high-pressure activity which led to the achievement:

"Two of the best engineers in the country were brought together at Washington. Their first conference, on June 3, lasted from afternoon until half past 2 o'clock in the morning. For five days neither man left the suite of rooms engaged for them. Consulting engineers and draftsmen were brought to Washington to assist them. The work in the drafting room proceeded continuously, day and night. Consulting engineers and motor manufacturers gave up trade secrets under the emergency of war needs. Twenty-eight days after the drawings were started the new engine was set up. This was on July 3.

"Parts for the first engine were turned out at 12 different factories located all the way from Connecticut to California. When the parts were assembled the adjustment was perfect. Both the flying and altitude tests of the new engine have been gratifying. One test was conducted at Pike's Peak and one of the engines in an airplane broke the American altitude record in a recent flying test. The new engine amounts practically to an international model. It embodies the best there is in American engineering and the best features of European models."

Motor Trucks While You Wait

Hardly less spectacular was the development of military trucks for the use of Pershing's army. The Society of Automotive Engineers, automobile manufacturers and the quartermaster's department of the army cooperated in designing the engine and truck parts. After the blue prints were sent to various part builders, progress was reported almost hourly. The dies for the engine crankshaft were sunk in five days. The pattern for the aluminum crank case and the first casting were completed in five days. One motor company had an engine running 11 days and 7½ hours after receipt of the blue prints. The first truck was completed three days ahead of schedule, and proceeded at once under its own power to Washington for official test.

With a standardized motor for airplanes and standard specifications for engines and parts for 3 and 5-ton military trucks, the groundwork for high-speed production of automotive war craft was firmly established. From September, 1917, when these designs were perfected, to the end of the war, the problem has been and will be one of production. The designers have practically completed their task; production engineers and manufacturing experts now are having their inning.

Shifting the Efforts of Industry

Shortly after the United States entered the war, there were signs of significant changes in the automotive industries. Large orders for airplanes from foreign countries had induced the builders of aircraft to extend their plants to many times their pre-war capacity. This was especially true of the Curtiss plant at Buffalo, which soon became the world's largest airplane factory. The change was also evident in the number of automobile accessory manufacturers who entered the airplane field, even while continuing their motor-car work. Then came indications of a growing interest of automobile builders in the airplane industry. The Willys-Overland Co. assumed a dominating interest in the Curtiss Aeroplane & Motor Corp., and immediately a gigantic plant was in the course of construction to take care of the large orders of the United States and foreign governments. Then Henry M. and Wilfred C. Leland, who had been prominent in the automobile field for many years, severed their connections with the Cadillac Motor Car Co. to form the Lincoln Motor Co., Detroit, a $1,500,000 concern, to build airplane motors. The Nordyke & Marmon Co., Indianapolis, undertook the building of airplanes in addition to its automobile work, and proceeded to erect a new plant for aircraft production.

One cannot view the change in the automotive industry without realizing that the American trait of specialization is a valuable aid in the present emergency. Had each of the 500 automobile builders in the country been equipped to make every part of the machines they produce, the burden of increased airplane output would have fallen heavily on a few of the larger companies. However, the automobile industry is made up of nearly 2000 concerns, over half of which specialize on one, or possibly a few, automobile parts. Thus in many cases a completed car represents the work of a score of factories.

A Wide Interest Shown

Therefore, when the airplane program attracted the attention of the automobile industry, not only the builders of cars, but also the manufacturers of carburetors, bodies, motors, roller bearings, ignition and lighting systems, lubrication devices, etc., entered the new field. Because of this wide distribution of work, the airplane program will be handled with much less confusion and with less detriment to the motor-car industry than would have been possible had specialization been undeveloped in America.

Airplane manufacture naturally divides into two parts. The power plant and the plane each requires a definite specialized type of equipment. Consequently the motors must be made by companies already building aircraft engines, by automobile builders equipped to make automobile motors, or by makers of accessories who have concentrated on motor production. The burden of supplying carburetors, oiling systems, ignition devices, etc., will fall on the manufacturers who have made these parts for the motor-car trade. In many instances the engines will be cast in one plant and machined in another. Moreover, the engine work may be still more widely distributed, as the types vary, gray iron and semisteel castings, and hollow hydraulic forgings being used for cylinders. The crankshafts will provide work for the makers of forgings, as will the connecting rods. Aluminum employed in pistons, crank cases and numerous small parts will absorb the effort of another branch of industry. The gear reduction between the engine and propeller will provide work for concerns which cut gears, while the propeller is the basis of an industry as yet largely undeveloped in this country.

Piano Makers Will Help

The structural part of the machine requires a wide variety of material. Spruce for the spars and struts is readily obtainable in America. Wire and rope for strengthening purposes are products easily secured in this country. Already the piano industry has been called upon to bear part of the burden of constructing the planes, an emergency measure employed by the Germans, who have taken over

the great Perzina piano factories in Schwerin to assist in airplane work. The engines must be hung and the planes fastened together by light, strong castings. An aluminum bronze alloy developing a tensile strength of 98,000 pounds with 34 per cent elongation has been adopted by one American airplane firm for this purpose. This metal can be cast in thicknesses of less than 1/16-inch.

The fuselage requires hardwood, sheet metal and canvas. The automobile body builders are perhaps best qualified to enter this field, and already one motor-car bodymaker, the Fisher Body Corp., has received an order for $5,000,000 worth of aircraft bodies. This part of airplane building will absorb a considerable tonnage of automobile sheets, a product which the steelmakers have been furnishing at the rate of about 600,000 tons annually. It is thought that the Curtiss company will bear the heaviest burden of fuselage construction.

The wings are the basis of a highly specialized industry in which women have been employed with great success in European countries. The framework, consisting of wood or steel, is the product of still another branch of industry. Seamless and welded tubing are employed on some types of machines.

Clocks, barometers, revolution counters, gasoline gages, radiator thermometers, pressure indicators for fuel systems, fire extinguishers, compasses, drift and wind gages and sets of specially made tools are accessories of airplanes which can easily be made by the hundreds of companies which make similar articles for the motor-car trade.

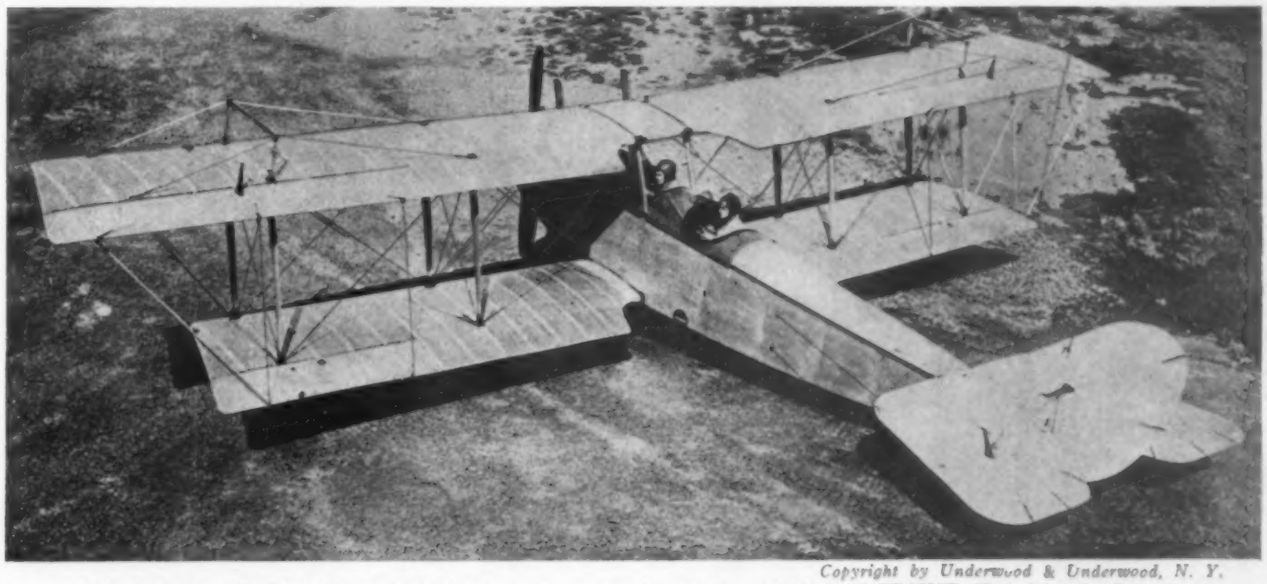
From the foregoing review of the many industries affected by the airplane program, it is evident that there is scarcely a branch of the iron and steel and metal working trade that will not share in the government aircraft appropriations. An appreciable demand has been and will continue to be noted by the steelmakers and producers of nonferrous metals. The finishing mills, especially those engaged in rolling light plates and sheets, will be affected. Makers and fabricators of structural steel have shared indirectly through the vast construction work required to prepare new plants, notably those of Curtiss, Nordyke & Marmon, Lincoln Motor, Wright-Martin and others. Machine-tool builders have likewise been called upon for a vast amount of equipment. In this connection, it must be remembered that although about 25 per cent of America's fleet of 22,000 airplanes are to be built and assembled in the plants of the Brasier and Renault automobile companies in France, the materials and equipment are being purchased in America.

Moreover, the length of the war will have an important influence on the magnitude of America's aircraft industry. The newspapers have published fantastic stories of the average life of an airplane, some of which would indicate that a machine is ready for the scrap heap after a few flights. Three years of the war, however, have proved to the satisfaction of the French chiefs of aviation that a military plane may be counted upon to give good service for four months. It is considered necessary to provide four planes for every aviator to insure an adequate reserve and to allow for machines temporarily out of commission for repairs. Thus to maintain a force of 5000 air pilots in France, the United States must produce at least 60,000 machines annually for the duration of the war. In the light of this reasoning, the government's decision to build 22,000 machines will have to be altered to meet a far greater demand than was anticipated. Accordingly, the end of the transformation of the automotive industry is not in sight, nor is its magnitude capable of even rough estimation.

Building aircraft to win the war is naturally the thought uppermost in the minds of those who are now engaged in the new industry. However, one cannot help but be curious as to the status of airplanes after the war. France and Italy are now operating aerial postal planes. The Caproni triplanes in the United States already have proved that great loads may be supported by large, heavy-powered machines. An amendment authorizing the placing of aircraft unfit for military purposes at the disposal of the post office department has received favorable action at the hands of one branch of congress. All signs point to the belief that after the war the heavier-than-air machine will hold a recognized position in the world's accepted methods of transportation.

The automotive industry is sure to progress along broad lines, not only during the war, but afterward. This is not only true of aircraft production, but holds equally good for the output of commercial trucks.

For the present, however, the allies must be motored to victory. In this great task, America, far better equipped than any other nation, will succeed



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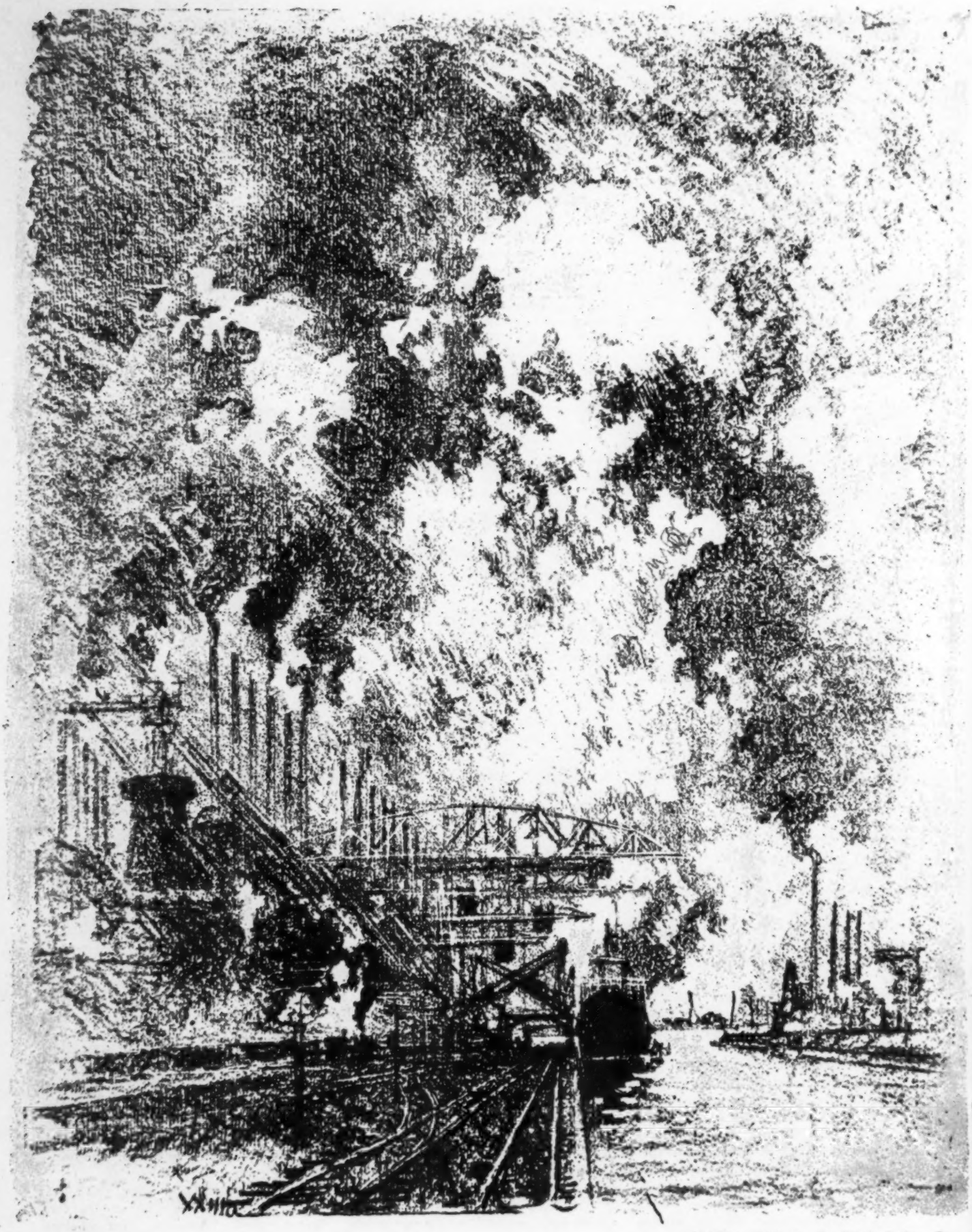
ONE OF THE LATEST MACHINES BUILT FOR UNITED STATES FORCES IN FRANCE (Passed by the Censor)



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UNLOADING IRON ORE AS VIEWED BY JOSEPH PENNELL

How Ore Districts Meet War Demand

Recent Exploration and Development Work in Lake Superior Fields Has Uncovered Sufficient Ore to Match Record Shipments of Past Two Years—Quickened Interest in Labor Saving Equipment Brings Out New Devices

BY R. V. SAWHILL

GERMANY'S suicidal attempt to wrest Verdun from the grip of its French defenders was based on a motive to which the hope of breaking through to Paris was only incidental. That motive was iron ore. A few miles from that battered shrine of France is the Briey ore basin which, beginning in French territory, extends through the old French province of Lorraine into Germany and Luxemburg. Geographically, Germany before the war controlled most of this basin. Actually the smaller French area held the bulk of the good ore.

The war was only a few hours old when Germany attacked and captured from France the latter's holdings in the Briey basin. At one stroke she placed the French steel industry under a handicap from which it still suffers and at the same time assured for herself, as long as the basin remained in her hands, a sufficient ore reserve to hold at bay for three and and a half years at least, the combined strength of France and the British empire.

Iron ore thus furnishes the explanation for much of Germany's success in both the early and late stages of the war. Iron ore in the same way will be the underlying cause of her defeat. The specific iron ore by which that defeat will be effected is that which annually pours out in such colossal tonnages from the Lake Superior district.

Today that district is recoiling quietly but efficiently from the depleting effects of the second of two successive years of abnormal demand upon its reserves. After bolstering up France and England for two years, the operators of the Lake Superior district face 1918 with the knowledge that the preservation of the United States itself now depends in a large measure upon their efforts.

America's education in modern warfare has brought with it a realization that her industrial independence was insufficient in many lines. The campaigns against waste on one hand, and for increased production on the other, which have been and are being carried on in the case of coal, petroleum, foods, etc., reflect the difficulties which are being encountered in satisfying the needs of ourselves and our allies for these essential materials. The absence of any such campaign in the case of iron ore reflects in the same way the efficient and satisfying manner in which the ore district has met the war demand.

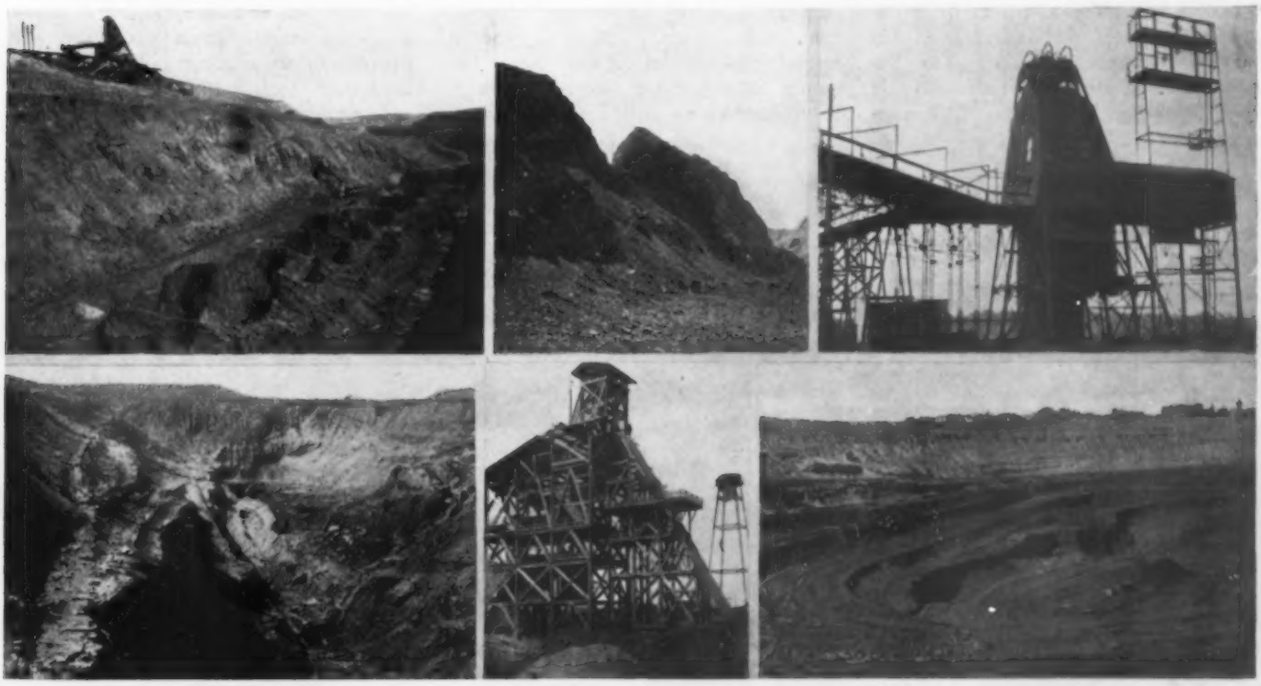
A study of conditions in the Lake Superior district at this time is particularly interesting as the new year will witness the first exertion of the splendid strength of the newly created

Table I

Approximate Shipment by Ranges

	Gross tons 1917	1916
*Mesabi	40,583,474	42,525,612
*Vermillion	1,545,602	1,947,200
*Cuyuna	2,407,983	1,716,218
Total Minnesota	44,537,059	46,189,030
*Gogebic	7,707,809	8,489,685
*Marquette	4,219,754	5,396,007
*Menominee	6,043,287	6,364,363
Mayville, etc.	175,000	219,381
Misc. shipments by rail	2,100,000	†
Totals	64,782,909	66,658,466

*Includes lake shipments only in 1917.
†Absorbed in range figures for 1916.



THE WONDERFUL MESABI RANGE IS MAKING POSSIBLE OUR EFFECTIVE PARTICIPATION IN THE WAR. TYPICAL MINES SHOWN ARE: (1) ALBANY; (2) MORRIS; (3) SCRANTON; (4) AGNEW; (5) YORK, SHOWING WASHING PLANT; (6) SUSQUEHANNA

THE BIG MAHNOMEN OPEN PIT ON THE CUYUNA RANGE SHOWING DEVELOPMENT

American army in the struggle in western Europe—possibly against that very ore basin which above all other things is vital to Germany's participation in the war.

Ore Reserves Unimpaired

The quiet confidence of the American steel industry in the sufficiency of its iron ore supplies has been disturbed on several occasions during the past two years as the result of a disbelief in the ability of the transporting facilities to bring this ore to the furnaces, but never from any fear of the inability of the ore district itself to place alongside the shipping tracks as much ore as might be needed. Anyone not in active and constant association with the Lake Superior ore fields, however, undoubtedly feels that the stupendous consumption of that ore during the past two years must necessarily have brought with it a decline in the available supplies. But despite record shipments and a somewhat slackened search for new deposits, the ore reserves in the Lake Superior district show only a slight decrease. In Minnesota, for instance, which holds the bulk of the ore, the reserve on May 1, 1917, was only 11,250,000 tons less than in 1916, a decline of 0.008 per cent.

For two years the ore producing district has had abounding confidence in its ability to supply all the ore that might be required; the ore consuming districts have had intermittent and recurring doubts concerning the placement of sufficient tonnages on the blast furnace yards to keep operations at the desired maximum. Today, with two years of successful performance in its favor, the ore producing district retains its calm confidence, while the fears of the ore consumers have practically disappeared.

The ability of the Lake Superior district to meet the 1918 demands of the iron and steel industry is beyond question. The transportation agencies again introduce the only doubtful factor into the situation and these agencies in turn have back of them two years of successful performance.

Freight Carrying on Lakes

The reaction of the lake fleet to war demands is a familiar story. Only a comparatively short time ago the maximum ore-moving capacity of the lake fleet during the short season of navigation on the Great Lakes was

ORE YARDS OF D. M. & N. AT PROCTOR, MINN., THE LARGEST IN THE

WORK WHICH HAS BEEN CARRIED ON ACTIVELY FOR SEVERAL YEARS

fixed by many of the vessel owners themselves at 53,000,000 tons. Yet in that same season of 1916, these bulk freighters actually carried 64,734,198 tons, while in 1917 they brought down 62,498,901 tons. Last year's record in many ways afforded a better index to the capacity of the lake fleet than did the heavier movement in 1916. The unusual severity of ice conditions in the early spring cut off practically one month of the season of navigation, it being early in June, in fact, before the full fleet began to approximate its greatest efficiency. In 1916, on the other hand, all of the connecting waterways between the lakes were open by April 22. Last year the fleet thus labored under a severe handicap from the opening of the season—a handicap which it was able only partially to overcome. In 1918, new factors will control the lake situation. The shortage of ocean bottoms has brought about the removal to salt water of most of the ships which can be taken through the Welland and St. Lawrence river canals; first through individual sales and, during the closing months of last year, through federal action. While only several of these vessels were of the bulk freighter type and were adapted for transporting iron ore, the removal of so many of the canal-size steamers has shifted to the bulk freighter fleet an additional freight burden. This is true particularly of the grain trade and a number of large ships which have not carried grain for a number of years brought down such cargoes during the closing weeks of the 1917 season.

Transportation conditions on the ocean, however, threaten to cut down the capacity of the bulk freighter fleet in another way, that is through the restriction of new construction. Whether or not the construction of many new ore carriers would have been started during recent months with costs at their present levels is highly problematical, but the fact remains that lake shipyards for some months past have not been in a position to accept additional orders for these large bulk freighters with any prospect of delivery before the spring of 1919.

Ocean ship owners, fortified by the high freights which they have been receiving, were in a position to disregard costs and all of the old lake shipyards and several new ones are concentrating every facility upon the production of canal-size steamers,

WORLD. MILLIONS OF TONS ARE HANDLED YEARLY THROUGH THIS YARD

practically all of which will be shifted to salt water as soon as completed. This construction now, of course, is in the hands of the Emergency Fleet corporation. Unless the disparity between the tonnage of ocean ships and ocean freight is more nearly adjusted, construction of bulk freighters on the Great Lakes is likely to continue practically at a standstill throughout the duration of the war.

Table II

Shipments by Ports and Railroads

	—Gross tons— 1917	1916
C. & N. W., Escanaba	5,208,733	5,348,199
C. & N. W., Ashland	6,484,166	6,716,089
C. M. & St. P., Escanaba	1,948,321	2,109,245
D., S., S. & A., Marquette	718,379	945,390
L. S. & I., Marquette	2,488,766	2,912,702
M., St. P. & S. Ste. M., Ashland	1,113,675	1,341,725
M., St. P. & S. Ste. M., Superior	1,712,962	1,279,064
N. P., Superior	695,021	417,012
G. N., Superior	11,570,757	11,090,970
D., M. & N., Duluth	20,567,419	21,837,949
D. & I. R., Two Harbors	9,990,990	10,735,853
Totals	62,499,099	64,734,198

Seven large bulk freighters were launched during 1916, the aggregate carrying capacity of these new vessels being about 82,000 tons. During 1917, there were 11 bulk freighters of 125,000-ton carrying capacity launched, but lake yards now are bare of such construction. However, several of the new boats operated during only a portion of the 1917 season, so that a slight increase is indicated in the 1918 capacity of the ore-carrying fleet—an increase which is more apparent than real owing to the shortage of small ships.

To Control Lake Trade

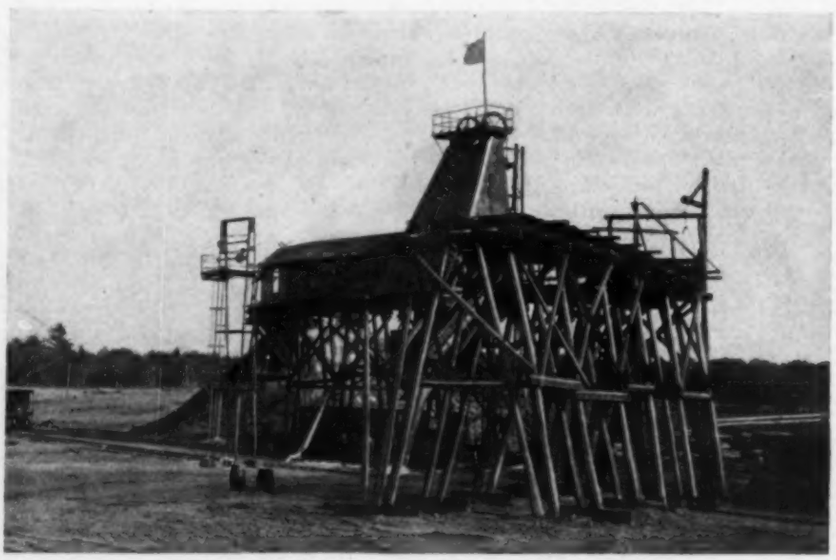
The new factor which promises, however, to have the most important bearing upon the ability of the lake fleet to transport iron ore during 1918 is the plan to place the operation of the ships under centralized control. The critical situation developed early last summer by the tardiness of the season's opening, for a time threatened seriously to result in an actual shortage of iron ore due to the inability of the lake fleet to begin moving freight. As an emergency measure, the distribution of the iron ore was placed in charge of a committee acting with the iron and steel committee of the council of national defense. Under this plan of distribution, the ore was allotted to docks in accordance with the supply of railroad cars. The distribution of the ore from the docks themselves also was centrally controlled in order to supply all furnaces with their minimum requirements and thus avoid overstocking some furnaces while others were closing down for lack of ore.

These war measures, coupled with the pooling arrangement under which the coal trade was handled, were effective in cutting down the restrictions imposed by the severe traffic congestion on the railroads leading from the ore-unloading docks, and in holding the time lost by the vessels through delays at unloading ports to a minimum. This kind of centralized direction has been broadened by the vessel owners themselves and the details of a comprehensive plan for placing the 1918 operations of practically all ore-carrying fleets under the central guidance of a committee of five are now being worked out. This committee will have duties similar to those of the war industries board organized by the railroads. The work of this committee is expected to bring about a maximum movement of iron ore, grain and coal on the Great Lakes next summer.

Various favorable physical conditions have materially assisted the lake fleet in the past two years in hanging up new freight carrying records. The most important of these has been the high water level, which permitted deeper loading of the vessels. Comparatively few accidents occurred in either year.

Labor Conditions Improved

In the ore districts a year ago, the labor situation stood out prominently as the factor which might interfere most seriously with the movement of iron ore. In the same way the opening of 1918 finds the conditions in the labor market introducing the greatest element of uncertainty. The situation now, however, is radically different from that of a year ago and the uncertainty over the maintenance of a sufficient supply of workmen arises from totally different causes. The unrest and agitation which outside influences had excited in the ore districts a year ago, simmered down during the winter and spring, had practically no appreciable effect during the summer, and at the present time seems to have disappeared as an element worthy of consideration. At the present time mine operators are giving more consideration to the effect which this country's entrance into the war may have, particularly the declaration of war early in December against Austro-Hungary. The percentage of alien miners in the ore districts is high and among these foreigners the subjects of Austro-Hungary are most numerous. However, the miners of many nationalities who emigrated to America from that polyglot nation have clung industriously to their picks and shovels up until this time and America's formal declaration of war against Austro-Hungary, in the opinion of most of

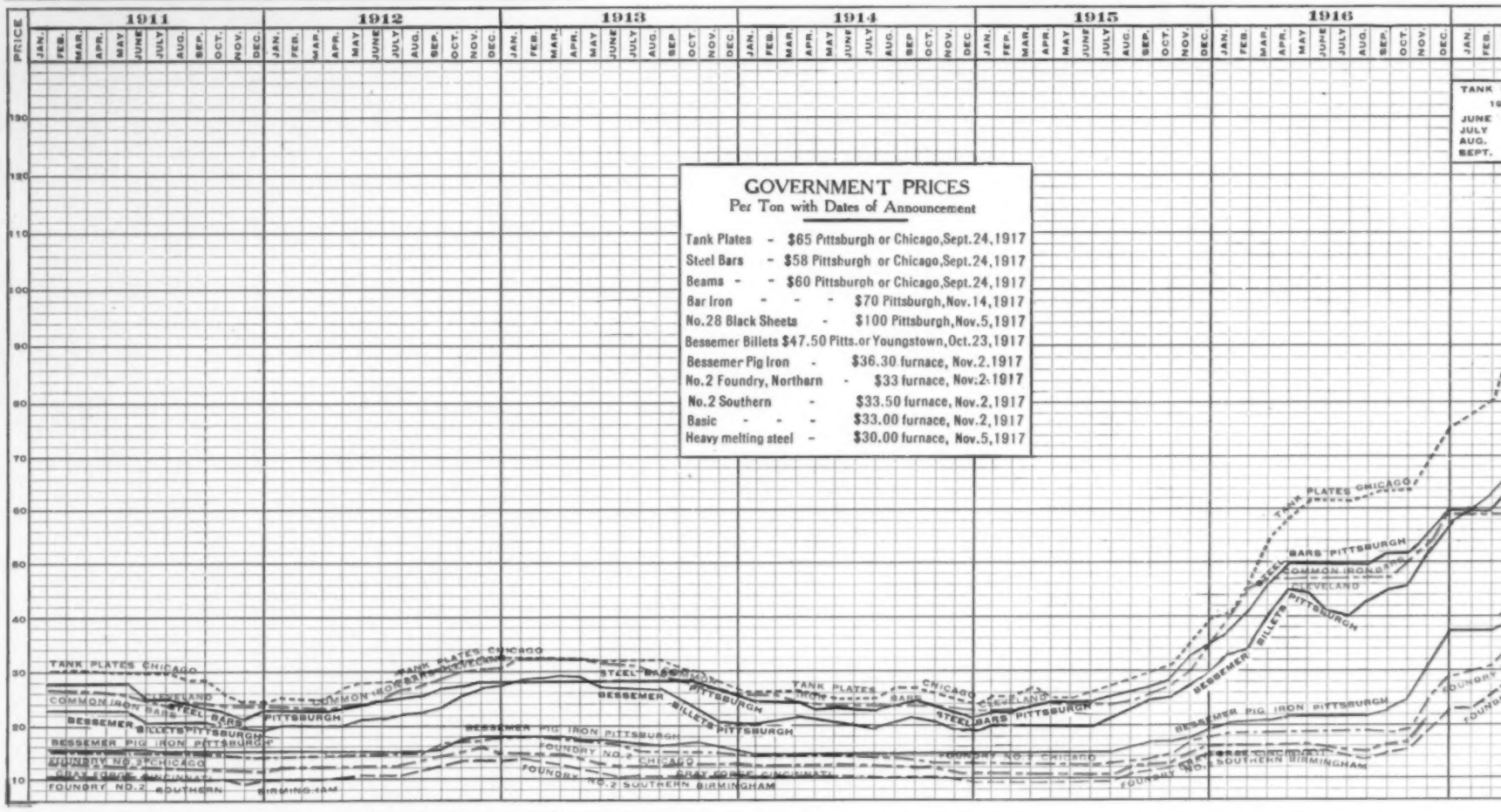


CROFT, ONLY BESSEMER MINE ON THE CUYUNA

FLUCTUATIONS IN IRON AND STEEL PRICES FOR TWENTY-THREE YEARS

Supplement to the issue of Jan. 3, 1918 **THE IRON TRADE REVIEW**

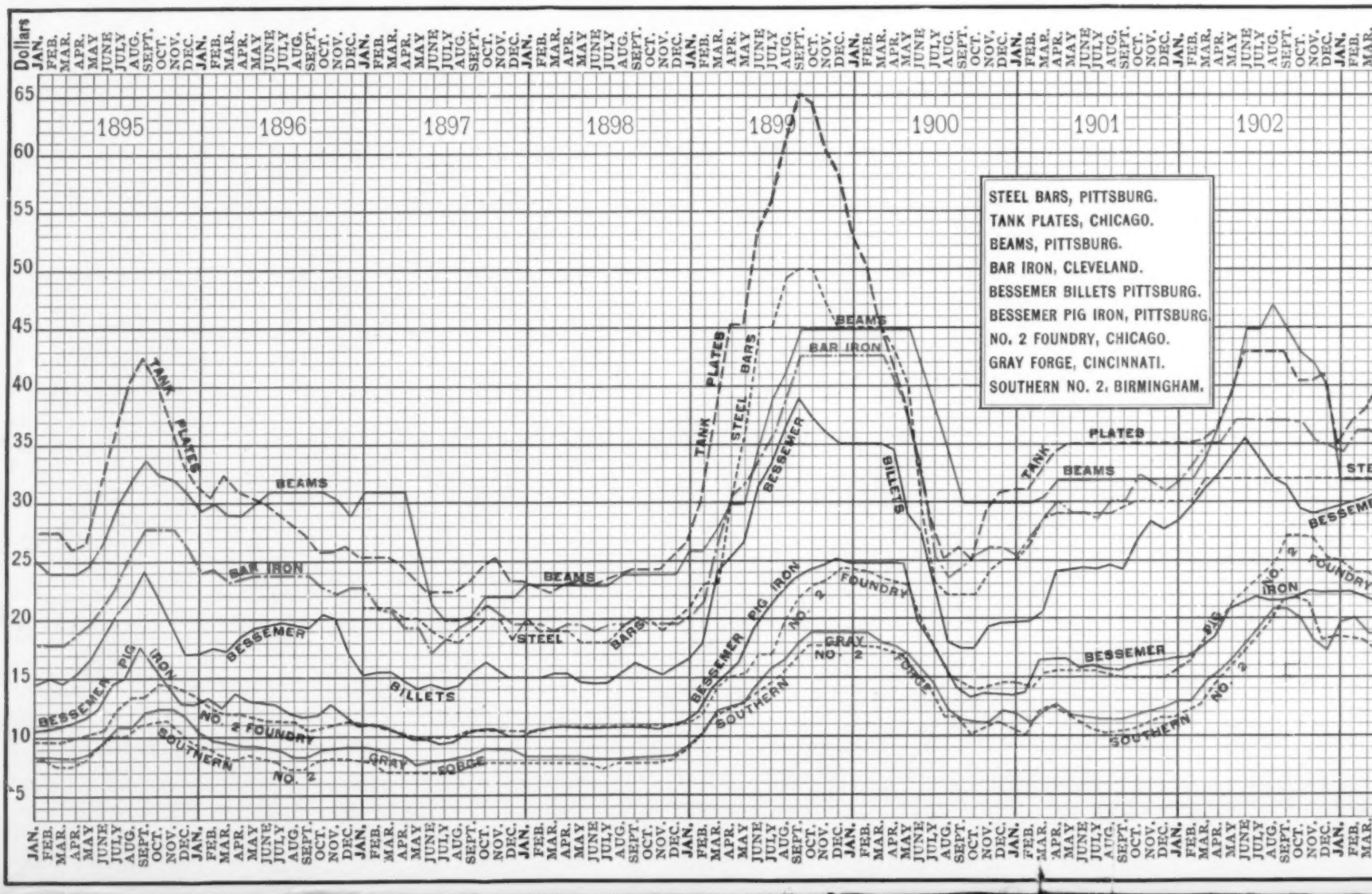
THE IRON TRA



GOVERNMENT PRICES

Per Ton with Dates of Announcement

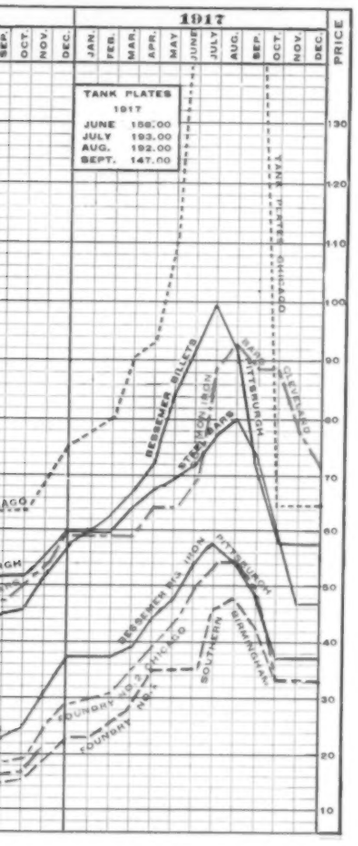
Tank Plates	$65 Pittsburgh or Chicago, Sept. 24, 1917
Steel Bars	$58 Pittsburgh or Chicago, Sept. 24, 1917
Beams	$60 Pittsburgh or Chicago, Sept. 24, 1917
Bar Iron	$70 Pittsburgh, Nov. 14, 1917
No. 28 Black Sheets	$100 Pittsburgh, Nov. 5, 1917
Bessemer Billets	$47.50 Pitts. or Youngstown, Oct. 23, 1917
Bessemer Pig Iron	$36.30 furnace, Nov. 2, 1917
No. 2 Foundry, Northern	$33 furnace, Nov. 2, 1917
No. 2 Southern	$33.50 furnace, Nov. 2, 1917
Basic	$33.00 furnace, Nov. 2, 1917
Heavy melting steel	$30.00 furnace, Nov. 5, 1917

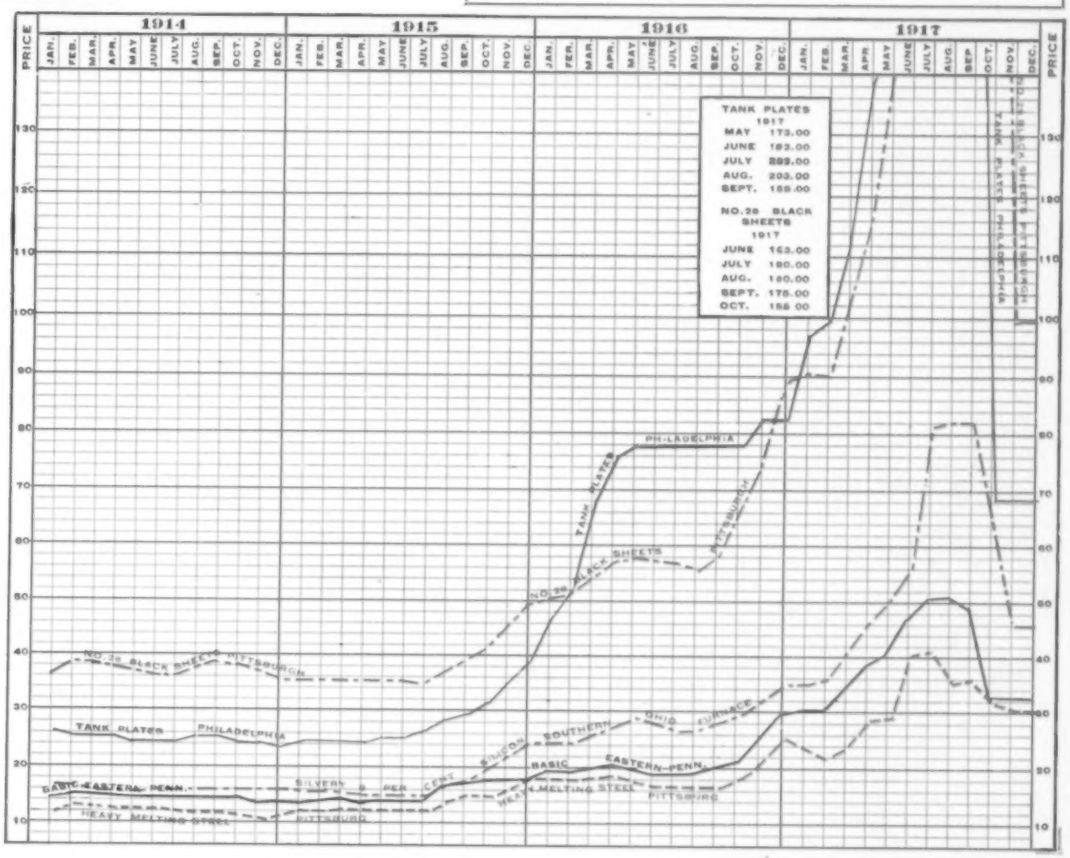


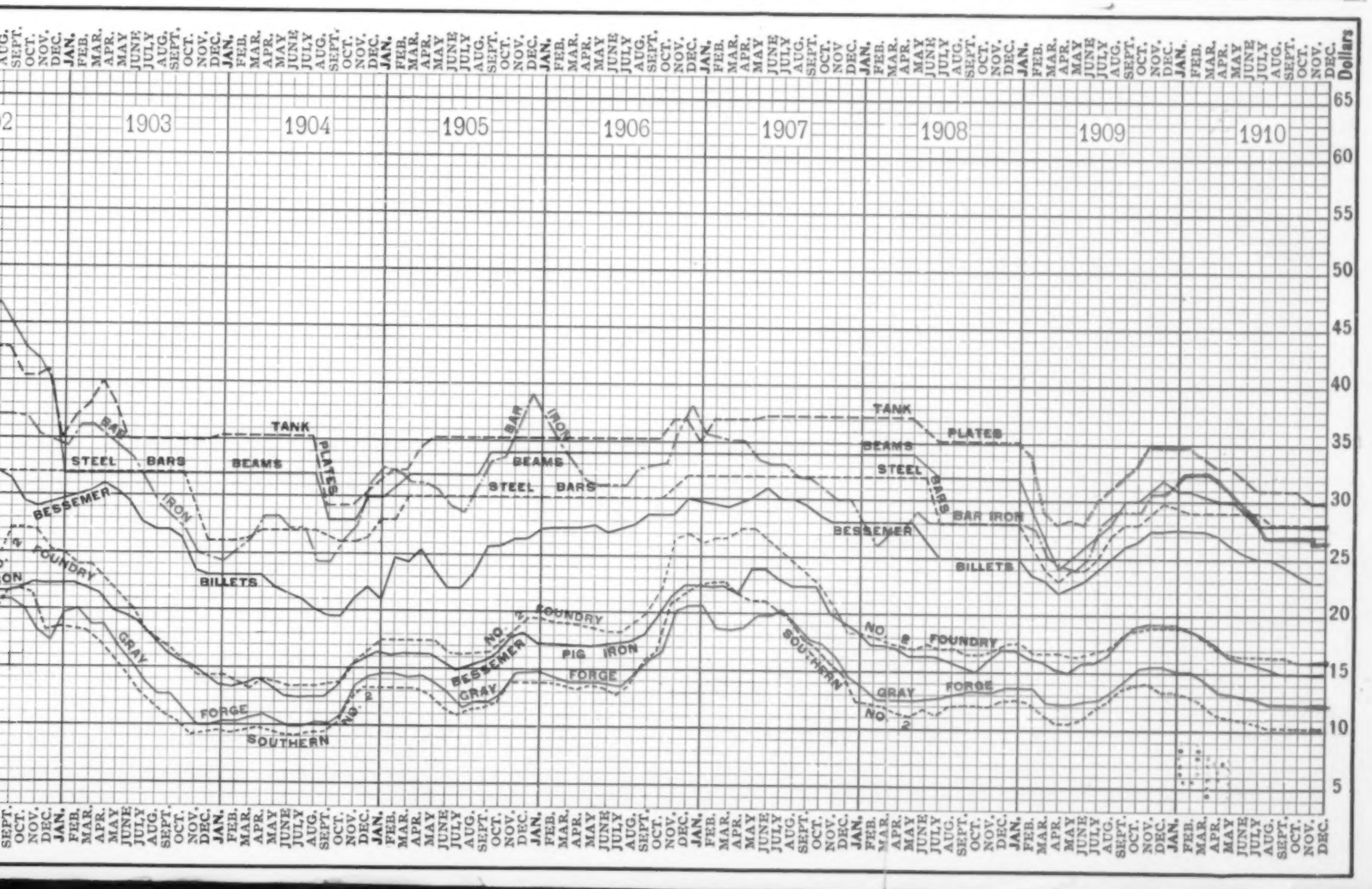
TRADE REVIEW

FINISHED PRODUCTS IN NET TONS
PIG IRON AND BILLETS IN GROSS TONS

Tables of Prices on which these Charts are based are published in THE IRON TRADE REVIEW, of Jan. 3, 1918







the mine operators in the Lake Superior fields will have little if any effect upon the willingness of these miners to remain at their labors provided federal restrictions are not imposed against the employment of these enemy aliens.

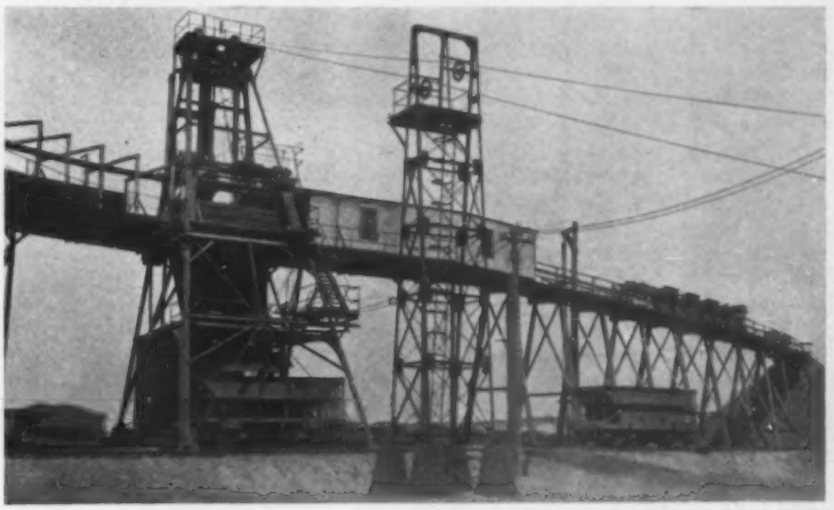
Ore Shipments in 1917

The shipments of iron ore in 1917 are estimated at 64,782,909 tons, a decrease of 1,875,557 tons from 1916, but 14,835,793 tons greater than 1913, which stands in third place. The decrease last year amounts to approximately 2.8 per cent from 1916, which in turn had shown a gain of approximately 41 per cent over the previous year. The following table, showing the lake movements by months, gives a clear insight into the splendid record hung up by the lake fleet after the ice barriers had finally been broken:

	Gross tons	
	1917	1916
April	211,532	1,658,411
May	6,283,612	8,449,580
June	9,639,991	9,507,576
July	10,241,633	9,750,157
August	10,146,786	9,850,140
September	9,536,152	9,600,786
October	8,193,892	9,116,196
November	7,333,828	5,715,452
December	911,475	1,085,900
	62,498,901	64,734,198

In its efforts to relieve the crisis occasioned by the late opening, the lake fleet was driven at high pressure. Although weather conditions in June were less favorable than in the corresponding month of 1916, the record for the month showed an appreciable gain over the tonnage which the fleet had been able to move in June of any preceding year. The high mark of 9,850,140 tons set in August, 1916, which had been the highest level ever reached in a monthly movement of iron ore, was outdistanced in July when shipments for the first time on record shot over the 10,000,000-ton mark. The August total dropped off slightly from the July figures, while during September and October the shipments were seriously retarded by delays imposed largely by congestion on the rail carriers. The 1917 records for those two months showed decreases from the corresponding months in 1916, but the splendid movement in November, when the fleet moved more ore than in any November on record, insured the year's movement being sufficiently large to take care of the requirements of the furnaces during the closed winter season. December's total was cut down by the severe cold weather which came early in the month.

Shipments of the Minnesota ranges accounted for practically 69 per cent of the lake movement while the all-rail movement from the ranges in that state were larger than usual. The three Minnesota ranges forwarded a total of 44,537,059 tons by lake against shipments from the three other ranges of 17,970,850 tons. Shipments from the Gogebic range were large, the movement from that range during the last two years having been heavily augmented by the recently developed open pits.



HEADFRAME AND TRESTLE, PHILBIN MINE

All-Rail Shipments

The all-rail movement for the season probably ran well over 2,000,000 tons. This compares with an all-rail movement in 1916 of 1,924,268 tons. The influence of the shipments entirely by railroads has increased remarkably during the past two years, as prior to 1916 the normal all-rail shipments in any one year averaged around 900,000 tons. The present increase of more than 100 per cent is accounted for partially by the normal increase in demand and specifically by the heavy tonnages which now move to the new plant of the Minnesota Steel Co., at Duluth. Shortages of ore in spotted instances during the winter of 1916-17 also caused some ore to be shipped all-rail to furnaces which normally receive their supplies by boat. Some ore moved all-rail as far as St. Louis, a fact which explains the experimental shipments made in 1917 of iron ore from Minnesota ranges to the head of navigation on the Mississippi river and thence by barge to St. Louis. The sharp appreciation at the present time of the need for greater utilization of the country's inland waterways, together with the increasing demand for greater productive capacity has led the backers of this experiment to predict that

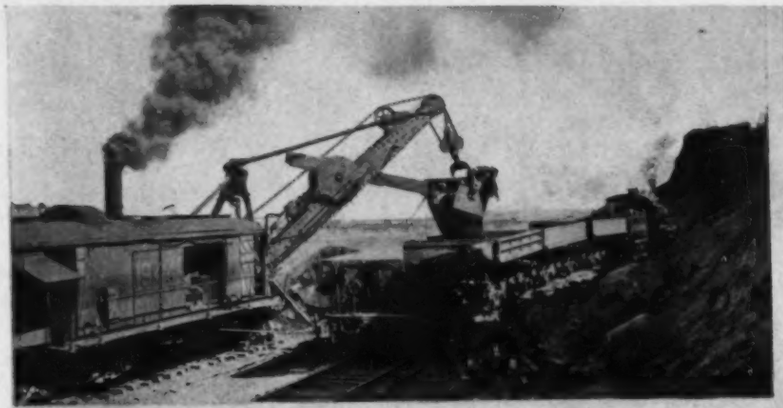
Table III

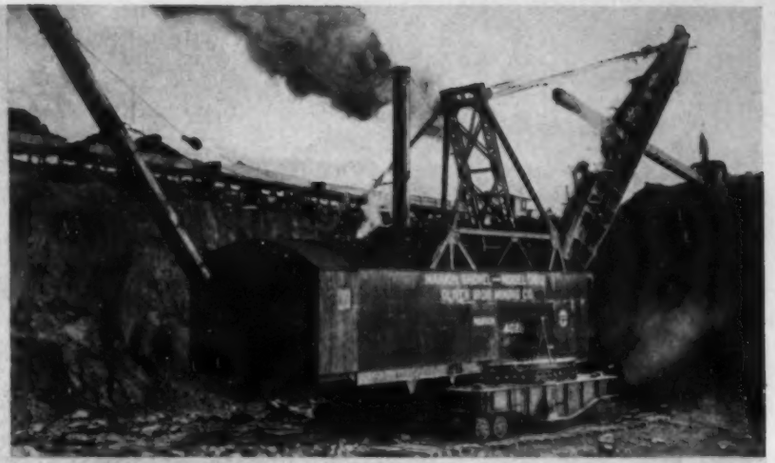
Minnesota Ore Reserves and Assessed Values

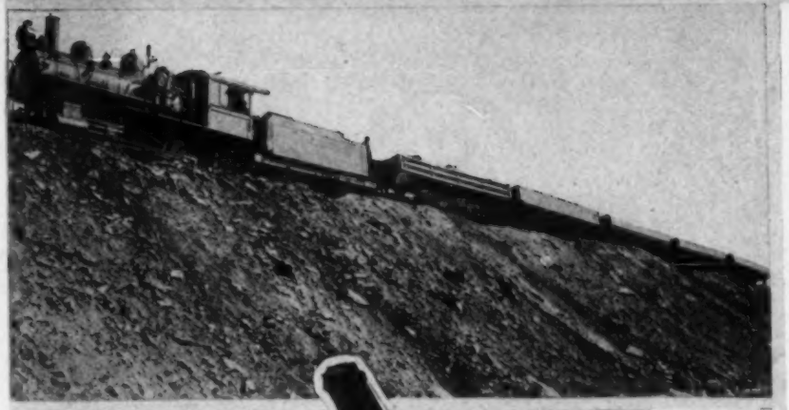
	May 1, 1916 Ore in the ground		May 1, 1917 Ore in the ground	
County	Tons	Assessed value	Tons	Assessed value
St. Louis	1,226,594,919	$249,129,433	1,227,883,575	$265,451,446
Itasca	161,997,784	18,680,793	158,151,458	18,990,435
Lake	169,758	45,199	256,320	68,246
Crow Wing	77,072,354	6,228,306	69,277,417	6,807,023
Totals	1,465,834,815	$274,083,731	1,455,568,770	$291,317,150

	Ore in stock pile		Ore in stock pile	
County	Tons	Assessed value	Tons	Assessed value
St. Louis	8,450,002	$3,063,722	6,869,594	$3,319,094
Itasca	411,575	68,236	462,792	80,436
Lake	70,133	46,671	77,399	77,399
Crow Wing	340,469	69,635	882,431	455,847
Totals	9,272,179	3,248,264	8,292,216	3,932,776

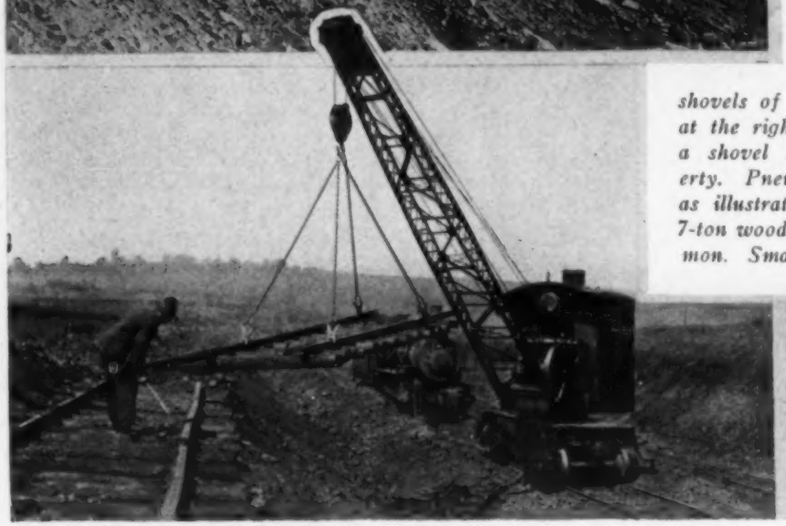
	Total merchantable ore May 1, 1916 Total in iron ore		Total merchantable ore May 1, 1917 Total in iron ore	
County	Tons	Assessed value	Tons	Assessed value
St. Louis	1,235,044,921	$252,193,155	1,234,753,169	$268,770,540
Itasca	162,409,359	18,749,029	158,614,250	19,070,871
Lake	239,891	91,870	333,719	145,645
Crow Wing	77,412,823	6,297,941	70,159,848	7,262,870
Grand totals	1,475,106,994	$277,331,995	1,463,860,986	$295,249,926







Throughout the Lake Superior district, more attention is being given annually to the development of labor-saving equipment. The past year has witnessed the wider adoption of many such devices in order to keep production at a high level despite the shortage of labor. More of the mammoth steam shovels of the type shown in the upper corner at the right are now in use. The view shows a shovel stripping at the Burt-Sellers property. Pneumatically operated 20-ton steel cars, as illustrated, are replacing the hand-operated, 7-ton wooden cars. Track layers are more common. Small views show a drag-line excavator.



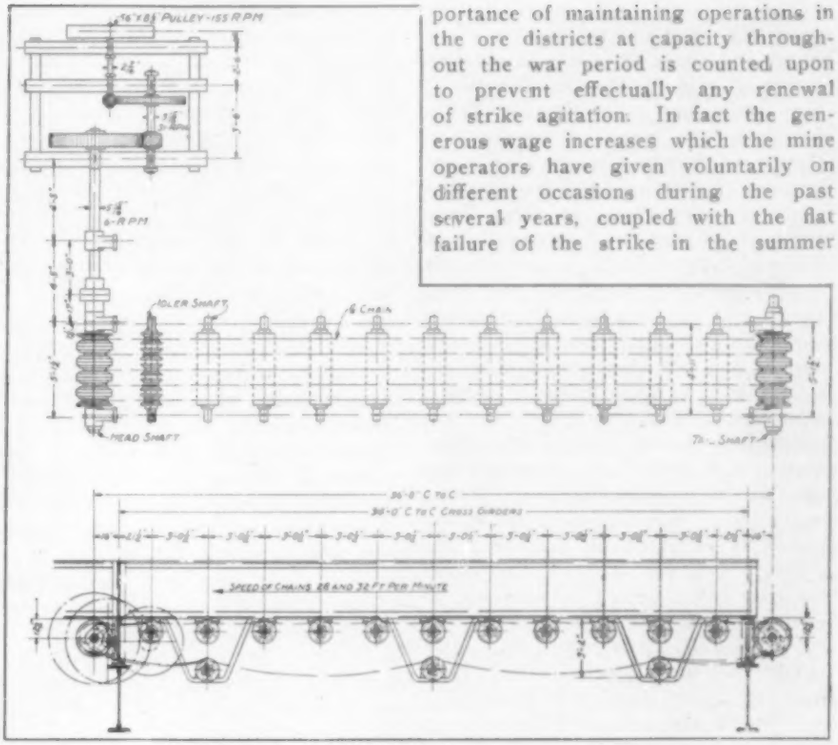
this new ore route will become of increasing importance.

The heavy shipments last year depleted the stockpile balances of most of the operators, but the actual tonnage now held in stockpile is slightly larger than that in reserve a year ago. Balances then were at a low point. The delays experienced in 1917 in shipping ore which the operators had contracted to deliver, held back a considerable tonnage and while mining operations were slackened to meet this condition, some of this ore is being carried on the stockpiles. These balances are being built up as rapidly as possible during the winter. Practically all of the mining companies on the old Mesabi and Cuyuna ranges are working as large a force as possible, not only to build up their stockpile balances, but to insure their mining organizations being held intact in preparation for efficient operation during the summer of 1918.

Labor Shortage Not Acute

The present efficiency of these mining organizations is higher than that which most manufacturers throughout the industrial districts of the country have been able to maintain. The influence of the present shortage of labor has of course extended into the ore fields but with decreased effect. The nation's call to war service has made large inroads upon the mining organizations in the Lake Superior district where the patriotic response has been surprisingly large in view of the importance attached a year ago to the anarchistic influence of agitators in the fields. Despite this loss, however, few operators were hampered last year by a shortage of workmen although the individual efficiency of the laborers is less now than it was a few years ago when wages were lower.

The principal element of discussion in the labor situation in the ore fields at the present time is the possible influence on the miners of this country's declaration of war against Austro-Hungary. The essential importance of maintaining operations in the ore districts at capacity throughout the war period is counted upon to prevent effectually any renewal of strike agitation. In fact the generous wage increases which the mine operators have given voluntarily on different occasions during the past several years, coupled with the flat failure of the strike in the summer of 1916, have been effective in clearing up that phase of the labor situation.



CHAIN GRIZZLY OF BARR TYPE

The problem of the enemy-alien miner, however, is a new one and the solution is expected to be found in Washington rather than among the miners themselves. Practically no statistics are available today showing the exact distribution of the many nationalities represented among the miners in the Lake Superior fields. An analysis of the war's effect upon the miners employed in the Lake Superior fields, presented in the Jan. 6, 1916, issue of THE IRON TRADE REVIEW is particularly pertinent at this time. It was pointed out then "that at the outbreak of war there was considerable fear in the iron ore country that the exodus of foreigners to join the armies in their native land might prove embarrassing. There is now nothing to indicate that there was any foundation for this anxiety; it is evident that the great bulk of the unnaturalized foreign laborers in the United States are well content to work in peace and security. Nationality statistics recently compiled by the Oliver Iron Mining Co. indicate that on the Mesabi range about 56 per cent of its employes are Austrians; approximately 14 per cent are Finns; and 11.5 per cent, Italians. Only about 10 per cent are Americans and the most of these occupy clerical or supervisory positions of some sort. In a typical district employing 1000 men, 17 nationalities are

Table IV

Shipments by Ports and Months

1917

Month	Escanaba	Marquette	Ashland	Superior	Duluth	Two Harbors
April	190,407	.....	.....	21,125	.....	.....
May	1,105,086	98,048	732,951	1,383,294	1,765,683	1,198,550
June	909,804	527,701	1,176,517	2,121,663	3,363,211	1,541,095
July	932,274	643,887	1,238,326	2,231,502	3,543,873	1,651,771
August	951,620	629,426	1,278,118	2,444,632	3,326,254	1,516,736
September	1,078,531	509,754	1,199,297	2,174,530	3,190,347	1,383,693
October	995052	461,284	978,029	1,876,525	2,497,629	1,385,373
November	838,096	327,113	900,241	1,516,162	2,583,620	1,168,596
December	155,984	9,932	94,362	209,308	296,802	145,087

1916

Month	Escanaba	Marquette	Ashland	Superior	Duluth	Two Harbors
April	398,214	53,258	147,852	211,340	538,281	309,466
May	1,045,186	561,555	955,041	1,722,341	2,671,044	1,494,413
June	1,159,424	539,327	1,101,370	1,945,234	3,116,665	1,645,556
July	1,044,368	680,779	1,302,682	1,986,631	3,012,492	1,723,205
August	1,061,285	634,786	1,289,439	1,950,249	3,380,066	1,534,315
September	922,517	557,140	1,255,328	1,945,171	3,455,611	1,465,019
October	876,488	519,806	1,218,134	1,732,865	3,298,314	1,470,589
November	772,417	273,801	665,339	1,132,642	1,982,872	888,381
December	177,545	37,640	122,629	160,573	382,604	204,909

Table V

Reserves by Ranges

	Tons, 1916	Tons, 1917
Mesabi	1,376,546,544	1,374,949,595
Vermillion .	12,215,917	11,341,758
Cuyuna ...	77,585,593	69,277,417
Totals ...	1,466,348,054	1,455,568,770

recognized. In this same district, about 300 of the 1000 employes are voters and about 250 more have taken out their first naturalization papers."

A census at this time probably would show a reduction in the percentage of Austrian laborers as many Serbians, Bulgarians and Roumanians who emigrated from the Dual Monarchy and registered originally as Austrians have little love for the country to which nominally they owe allegiance. At this time they probably would register as subjects of Serbia, Bulgaria or Rumania. A considerable percentage of others probably would seek to avoid the restrictions imposed upon Austro-Hungarians now by affirming allegiance to one of the Balkan states. Proper handling of the situation at Washington is expected by the ore operators to dispel thoroughly the cloud hanging over the enemy-alien situation. A few of the foreigners in the district may attempt to cause trouble, but the influence of any German propaganda has been negligible in the ore fields and little trouble is expected from such intrigue.

Wages Are Boosted

Two wage increases were granted by the mine operators during the year, bringing the pay for common laborers up to $3.45 a day. This represents an increase of 10 per cent over the wage in effect after May 1, 1917, when common labor was raised to $3.15 a day. The latest increase was granted on Oct. 1. The following table reveals at a glance the wages paid in the ore district now and at various periods throughout the last two years. In 22 months the wages of common laborers jumped from $2.25 to $3.45; those of company account miners from $2.60 to $4, and those of contract miners from $2.75-$2.85 to $4.70-4.75. The wage table is as follows:

	Daily wage		
	Dec. 1, 1915	Dec. 1, 1916	Dec. 15, 1916
Com. labor....	$2.25	$2.60	$2.85
Miners (co. act.)....	2.60	2.90–3.00	3.20–3.30
Contr. miners.	2.75–2.85	3.50	3.85

	May 1, '17	Oct. 1, '17
Common labor	$3.15	$3.45
Miners (co. acct.).....	3.40–3.50	3.70–4.00
Contract miners	4.25	4.70–4.75

In the ore fields common labor includes dump and track men and ordinary surface workers and in general men who work in gangs. A flat daily wage is paid to company account miners, while contract miners work on a piece work basis. While most of the contract miners are now averaging from $4.70 to $4.75 a day, many of them are earning much higher wages. Most of the Lake Superior miners prefer the contract system as it permits the miner to earn a larger wage. The rate of pay on contracts is fixed at the beginning of each month and in most cases the rate is never changed during the month except to grant an increase. While the average pay of miners working on company account is from $3.70 to $4 a day, the pay varies at different mines and in some instances runs up to $4.25 and higher.

Labor-Saving Equipment

A study of labor conditions in the Lake Superior district at the present time reveals the serious consideration which practically all operators are giving to the problem of developing labor-saving equipment and expanding its use. The use of larger steam shovels is becoming more widespread, while more attention is being given to the use of track layers and dirt spreaders. With these machines, dirt after being dumped from the cars can be leveled quickly and the track shifted to the new edge of the dump without delay. The method, of course, permits a considerable reduction in the number of men required, from the old method of spreading the dirt by hand and tearing up and rebuilding the tracks each time a shift was necessary.

In line with the same development, more attention is being given to the use of heavier mine railroad equipment. Twenty-ton steel cars, as shown in one of the accompanying illustrations, are rapidly coming into more general use. Heavier locomotive equipment also is being used with a consequent demand for stronger and heavier track equipment and for the tamping machines. The 20-ton steel stripping cars take the place of hand-operated wooden cars which had a capacity of only 7 tons. The steel cars are pneumatically operated.

Some experimental work also is being carried on in developing ore loaders for use in underground mines. Progress has been made in reducing the weight and head of loaders. Tests were conducted in the Virginia district a few weeks ago with a new type of unloader which is built along the same lines as a steam shovel.

The Oliver Iron Mining Co., the mining subsidiary of the United States Steel Corp., shipped 27,856,451 tons in 1917 against 31,673,131 tons in 1916. The company's share of the total movement last year was 43 per cent compared with 47.52 per cent in 1916; 47.63 per cent in 1915; 49.01 per cent in 1914; and 49.06 per cent in 1913. This comparison shows clearly the steadily mounting importance of the independents. In 1908 the Oliver company handled 56 per cent of the total movement. Since that time, with the exception of 1909 and 1911, the independents annually have handled more than half of the ore shipped.

While the heavy drafts on the ore reserves during the past two years have been countered largely by the active prosecution of development and exploration work, many of the larger companies are fortifying themselves by the purchase or lease of properties upon which ore tonnages have been proved. While the taking over of the last of the active Hill mines by M. A. Hanna & Co., Todd-Stambaugh Co., Inland Steel Co. and Jones & Laughlin Steel Co. furnishes the most striking example of this tendency, a number of other sales and leases have been concluded by various independent firms. Coates & Tweed, for instance, have disposed of the big Plymouth mines, a new open pit on the Gogebic range adjacent to the Wakefield mine. Stripping was begun at the mine just two years ago and ore shipments already aggregate close to 1,000,000 tons. This mine will be operated by Pickands, Mather & Co., a new company, the Plymouth Mining Co. having been formed to take over the mine. The other firms interested in the Plymouth Mining Co. are the Youngstown Sheet & Tube Co., Lackawanna Steel Co., Alan Wood Iron & Steel Co. and the Steel Co. of Canada. Coates & Tweed also have concluded negotiations with Pickands, Mather & Co., by which the latter in conjunction with the Republic Iron & Steel Co., will take the entire output of the York mine on the Mesabi range. This is an open pit which shipped this year for the first time and which will probably forward about 200,000 tons in 1918. The ore is of bessemer grade. Stripping with a drag line excavator is now being continued at the York property. The ore is hoisted from the pit by means of a balanced skip.

Retirement of Hill Interests

The acquisition by various large independent operators of the bulk of the Hill ores probably marks the retirement for some years of the Hill interests in either an active operating or leasing capacity. The Arthur Iron Mining Co. which was formed immediately prior to the surrender by the Steel corporation of the Hill lease and which for several years has been the operating agent for the Hill interests on the Mesabi range, has given up all of its mining activities.

The leases concluded by the Hill

interests during the year included practically all of the properties which have either been developed or are available for early exploitation. The remaining Hill properties contain an immense tonnage of ore, much of which, however, is not profitably available for use at this time. M. A. Hanna & Co., who took over some 40,000,000 to 50,000,000 tons, have been carrying on active operations on their properties. Included in the Hanna lease were the Leonard, Harold, Thorne, Wabigon No. 1, Wabigon No. 2, Fay, Enterprise and Mesabi Chief mines, as well as the Great Northern interests in the North and South Uno properties. The Jones & Laughlin Steel Co. has been carrying on work on the properties they leased last year including the big Hill Annex mine and open pit, and the South Agnew, an underground mine. A new shaft is being sunk at the latter mine. Pumps are now at work unwatering the old underground Mississippi mine, the other property taken over by the Jones & Laughlin Steel Co.

The Republic Iron & Steel Co. is carrying on drilling work at the Gordon property of the Northern Pacific interests just south of the Bray mine. Another Northern Pacific property, the Washoe, now known as the Danube, originally taken over by the Tod-Stambaugh Co., is now controlled by Pickands, Mather & Co. The big Dunwoody open pit which had been taken over some time previously by the Tod-Stambaugh Co. and the Inland Steel Co., was operated throughout the year and is in shape to continue heavy shipments.

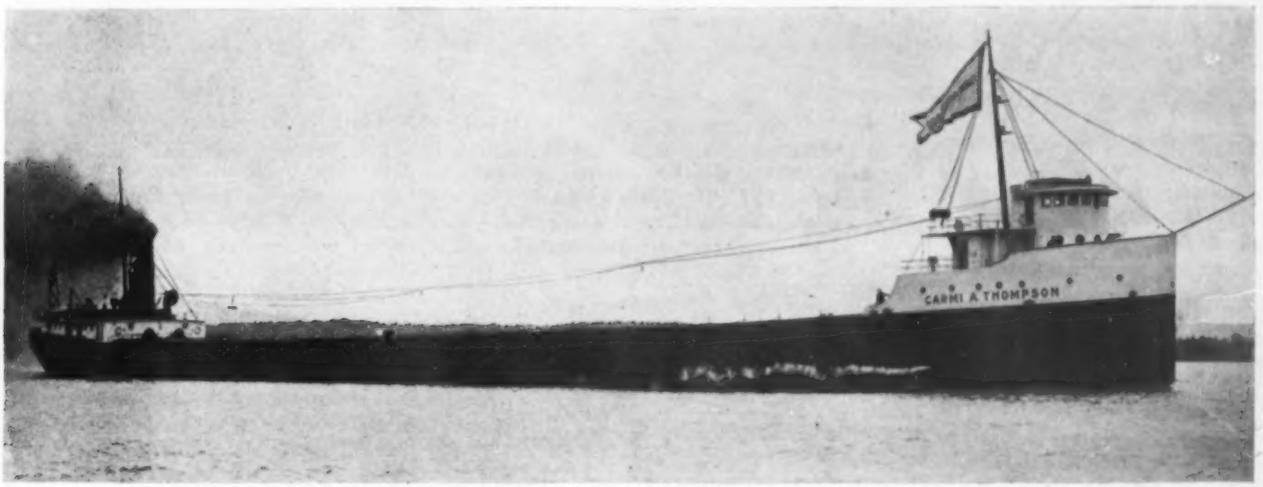
While the Oliver Iron Mining Co. is not developing any large new properties, active work is being done in uncovering ore at developed mines and the company is in a splendid position to forward its usual heavy tonnage. The largest project which the Oliver company is now carrying on is the stripping of the Missabe Mountain property in the Virginia district. This mine is a state lease formerly operated as a part of the Virginia group in conjunction with the Norman, Ohio and Lone Jack mines. The Missabe Mountain is understood to contain 55,000,000 tons of ore. The development work on one part of the mine revealed a reserve of 20,000,000 tons where early explorations had indicated that no ore would be found. Stripping is being pushed actively and this mine will shortly rank among the heaviest shippers of the Mesabi range. Three shovels are at work in the Missabe Mountain mine this winter and more than 1,000,000 tons probably will be shipped durng 1918. The Ohio and Lone Jack mines have both shipped, but the bulk of the ore is being held in reserve. The Norman mine is approaching exhaustion.

The Arcturus, a big open pit property on the western Mesabi which has been under development by the Oliver company for several years, shipped 300,000 tons in 1917. The Kerr mine, which entered the shipping list in 1916, forwarded more than 1,500,000 tons last year. This mine is located west of the Hull Rust which last year shipped 6,376,422 tons. In 1916 the Hull Rust mine shipped 7,665,611 tons, giving in the last two years total shipments of more than 14,000,000 tons from this great property. The Sauntry-Alpena mine, formerly an open pit, now is being worked entirely by underground methods. The Oliver company on Jan. 1 gave up its lease on the Graham mine.

One of the biggest exploration and development projects ever carried out on the old ranges has just been started by the Republic Iron & Steel Co. The company has taken over a large tract immediately west of the Montreal mine. The tract includes all of section 31, township 46, range 2; section 6, township 45, range 2; and practically all of section 32, township 46, range 2. Some ore was shipped years ago from old mines on this tract. In section 32 are the old Father Hennepin, Pence and Snyder mines. These have all been explored more or less, but two of them have not been worked for 25 years. In section 6 is the Plumer mine. Both the Pence and Plumer mines have been operated in a small way in recent years, the Plumer having been owned at one time by the Oliver Iron Mining Co.

Unusual interest attaches to this big exploration by the Republic company as the properties lie at the extreme western end of the Gogebic range and if the Republic company is successful in discovering ore a considerable increase in the size of the Gogebic deposit would be indicated. On the Plumer property is a 1300-foot shaft which will be used in carrying on the sinking and drilling underground. Five drills are now being employed. Under the supervision of Francis J. Webb, Duluth, general manager for the Republic Iron & Steel Co. in the Lake Superior district, all of the land contained in these three sections will be thoroughly drilled and explored. F. H. Cash, superintendent of the Kinney mine on the Mesabi range, is acting as superintendent of construction, with L. L. Wilcox, chief engineer in the Lake Superior district for the Republic Iron & Steel Co., in charge of explorations.

The Republic company has been operating its developed mines steadily and is pushing work this winter.



ONE OF THE BIG BULK FREIGHTERS BUILT DURING 1917

A new level is being opened at the Pettit mine on the Mesabi, while a new shaft is being sunk at the Franklin mine to remove the ore left in the old shaft pillar. The electrification of the Antoine (Clifford) mine on the Menominee range will be completed this year.

M. A. Hanna & Co. are sinking a new five-compartment shaft at the Hobart mine on the Mesabi. A modern steel headframe is being built. Underground operations at the Sliver mine will be finished this spring. The mine is being continued as an open pit. The Frantz mine near Buhl was operated in 1917 after some years of idleness. The Hanna company has just completed sinking the No. 2 shaft at the Thorne mine and will reach the orebody soon. This is an extension of the Thorne No. 1 deposit which will be exhausted at the end of this year. The Leonard mine is being put in shape for operation, the open pit having just been pumped out. The Alexandria mine which the Hanna company operates for the Donner Mining Co., has been fully electrified.

The estimates of the tonnage of ore still remaining in the Minnesota ranges, as prepared by Rukard Hurd, director of the department of mines and natural resources of the Minnesota tax commission, indicate a slight decrease in the reserve on May 1, 1917, as compared with the corresponding date of 1916. The estimates are shown in Table III.

Huge Ore Reserve

The ore estimated to be in the ground on May 1, 1917, aggregated 1,455,568,770 tons, a decrease of 10,266,045 tons from May 1, 1916. On the same dates Minnesota stockpiles held 8,292,216 tons, and 9,272,179 tons, respectively, a decrease on May 1, 1917, of 979,963 tons. The aggregate tonnages both in the ground and in stockpiles on the two dates were 1,463,860,986 tons and 1,475,106,994 tons respectively, a net decrease in 1917 of 11,246,008 tons.

As indicated in Table V, the decrease in reserve occurred largely on the Cuyuna range. The commission estimated that on May 1, 1917, the Cuyuna range reserve was 69,277,417 tons against 77,585,593 tons on May 1, 1916. The loss of 8,300,000 tons resulted partially from shipments and largely from revisions of earlier estimates of the tonnages in reserve on the newest range. The estimate for the Vermillion range reserve showed a decline during the year ending May 1, 1917, of about 875,000 tons. The remainder of the decrease for the Minnesota ranges, or about 1,600,000 tons, occurred on the Mesabi range face of the shipments during the calendar year 1916 of 42,525,612 tons. As indicated in Table III, the assessed value of the ores increased materially despite the slight decrease in the taxable tonnage. For the ores on the three Minnesota ranges the assessed value on May 1, 1917, was placed at $295,249,926 against $277,331,995 on May 1, 1916.

The loading facilities at the head of the lakes have been increased by the completion of the new dock of the Soo line at Ashland, Wis. This dock is 80 feet high and 59 feet from outside to outside of pockets. It has 150 pockets of 350 tons capacity each, giving a total capacity of 52,500 tons.

New Washing Plants

The close attention which has been paid in recent years to the problem of handling lean ores is evidenced by the rapid construction of washing plants on the western Mesabi. During 1917 new washing plants were placed in service at the York mine of Coates & Tweed, the Kevin mine of Butler Bros. and the Pearson mine of the Shada Mining Co. New plants are now being built at the Majorca and Danube mines of Pickands, Mather & Co., and at the new Draper mine of the Draper Iron Co. At the present time the following plants are in service or under construction for handling western Mesabi ores: Trout Lake, Oliver Iron Mining Co.; Hawkins, Wisconsin Steel Co.; Crosby, Cleveland-Cliffs Iron Co.; LaRue, M. A. Hanna & Co.; Madrid, C. K. Quinn; Quinn-Harrison, Butler Bros.; York, Coates & Tweed; Kevin, Butler Bros.; Pearson, Shada Mining Co.; Majorca, Pickands, Mather & Co.; Draper, Draper Iron Co.; Danube, Pickands, Mather & Co.

The Pearson mine is an underground property and the plant there has just been started. It has a capacity of about 75 tons an hour. In its first year of service, the York plant handled about 60,000 tons of ore and will probably handle between 175,000 and 200,000 tons in 1918. At the Majorca mine is a one-half unit plant with tables. The Draper plant also is of one-half unit size. This mine is located about 1 mile from the Majorca mine which in turn is adjacent to the Hill Annex mine.

Pickands, Mather & Co. will probably place in service this year a full unit plant at the Danube mine between Taconite and Bovey on the western Mesabi. This plant will be the largest of any on the range with the exception of the big Oliver plant at Coleraine. The Kevin plant is a one-half unit one, while an additional half unit has been added to the Quinn-Harrison plant, making it of unit and one-half size.

The electrically driven hoist which was built for handling ore from the York pit was successfully operated during 1917 and other hoisting systems of this type are now being employed. This system was described in THE IRON TRADE REVIEW of Jan. 4, 1917. It is particularly adapted for comparatively small open pit properties where the construction of an adequate approach is difficult. A system of 2-ton capacity hoists is used at the Pearson mine, while 3-ton skips will be in service at the Majorca and Draper mines.

An interesting development in the design of washing plant is being carried out at the Danube mine of Pickands, Mather & Co. At this mine it was found advisable to crush the ore before sending it to the washing plant. All of the ore will be put over a chain grizzly, the undersize going to the bins and being then drawn by a chain conveyor to the mill. The oversize, that is the material not passing through the grizzly, will go to a large 48-inch steel conveyor so arranged that the large chunks of rock and taconite can be rolled off in the same manner as from a picking belt. The remainder will be delivered by the conveyor to an all-steel, 48 x 36-inch jaw crusher and crushed. From the crusher it will be sent to a cross conveyor, reaching the mill by means of the main conveyor.

The washing plant at the Danube mine is of full unit size with a large revolving screen, two 25-foot washers, four 18-foot washers and complete table equipment. All table concentrates will be dewatered. The concentrates will reach the bins from shuttle conveyors—an arrangement which is designed to secure a better mixture of the different grades of concentrates.

Rock-Separating Devices

Pickands, Mather & Co. are placing in service at the Albany mine this month a screening plant. The problem of screening also has been yearly assuming greater importance and various different types of rock-separating devices have been developed. A screening device developed at the Susquehanna mine of the Rogers-Brown Iron Co. to meet a condition similar to ordinary rock separation, was described at length in the Jan. 4, 1917, issue of THE IRON TRADE REVIEW. The new screening plant at the Al-

(*Continued on Page* 108)

Making Good With Tradition Discarded

By A. O. BACKERT

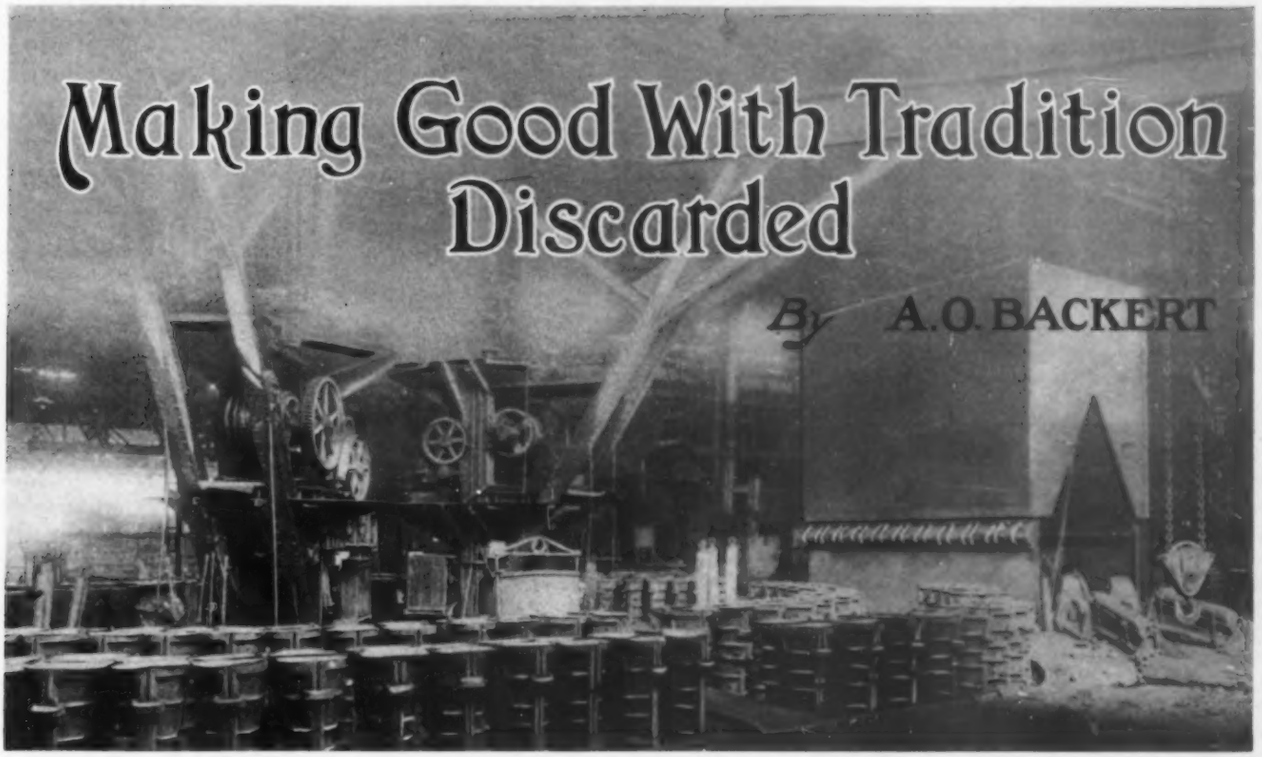


Fig. 1—Section of One of the Pipe Casting Pits in the Foundry of the American Cast Iron Pipe Co., Birmingham, Ala. In the Foreground is the Shake-out Grating and at the Right is a Large, Double Sand Bin

ACIPCO is not Utopia. It is a suburb of Birmingham, Ala., which has grown up around the activities of a cast iron pipe foundry where the human element is considered the basic factor upon which industrial success depends. It is the conviction of the owners and operators of this plant that a man expects, and has a right to expect, something more than the sum he gets in his pay envelope, and by carrying into execution this conviction Acipco has been made possible. Lacking a better term it may be characterized an industrial community—but it is more. Not mere welfare, but fraternity has been sought and this spirit has been fostered and attained among it inhabitants. At this community the American Cast Iron Pipe Co. daily converts more than the output of a modern blast furnace into castings. Here more than a thousand men are employed, three-fourths negroes, into whom has been instilled the spirit that the success of manufacture depends on them, regardless of how insignificant may be their tasks. The reciprocal spirit of the company is its unlimited interest in their troubles, trials and tribulations, and it stands ready at every turn to give them aid if they are worthy. And fraternalism has welded employer and employe into a mighty and efficient industrial force.

With tradition in the discard in its relations with its employes, the company likewise has consigned it in the operation of its plant. The industrial and technical philosophy of Acipco is simplicity itself. *"Nothing is impossible of achievement,"* expresses it completely. This is the spirit that successfully developed the 16-foot cast-iron pipe in this foundry several years ago. A more recent innovation is the use of hot metal from a neighboring blast furnace, which is mixed with the cupola metal in varying amounts to obtain the specified analysis for cast pipe. That sound pipe could not be produced in greater than 12-foot lengths was one of the many traditions of pipe foundry practice. Its advantages never were questioned, but the fact that it had never been made before seemed sufficient reason for not producing it now, until the problem was solved by this company. Sizes from 4 to 12 inches are being made in 16-foot lengths effecting a saving to the purchaser of 25 per cent in bells and a reduction of one-fourth in number of joints. The reduction in the cost of labor and material in laying 16-foot pipe as compared with the established standard of 17 feet, is estimated to be about $2.75 per ton under prevailing conditions. Furthermore, the lessened number of joints makes a more efficient pipe line. Owing

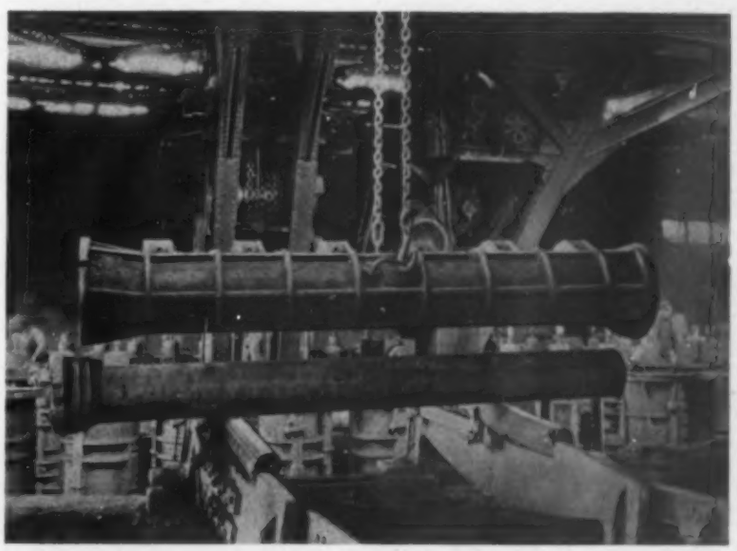


FIG. 2—SHAKING-OUT CAST IRON PIPE BY OPENING THE HINGED FLASK. THE SAND FALLS INTO THE GRATING SHOWN IN FIG. 1

to the favorable location of the foundry in the heart of the Birmingham iron producing district, where it is practically surrounded by blast furnaces, the use of direct metal with cupola iron was facilitated. Introduced at a time when record prices were prevailing for coke, the fuel economy was considerable when spread over approximately 70 tons of iron daily, none of which had to be remelted with coke. Even at today's prices for coke, the saving is considerable and the success of the venture has been proved. A tremendous sand-preparing and conveying plant which serves two of the double pits is another improvement that must be characterized as an innovation for a plant engaged in the manufacture of this product.

FIG. 3—DRAWING FOUR PIPE PATTERNS IN ONE OPERATION

FIG. 4—SETTING THE CORES IN CAST IRON PIPE MOLDS

Located on the outskirts of Birmingham, the company's property spreads over a total of over 200 acres, which is ample for the growth of the plant and has made possible the building of a model industrial community. The output of the foundry aggregates about 120,000 tons of cast iron pipe and fittings and special castings annually, or at the rate of 400 tons of pipe daily and 200 tons of miscellaneous castings monthly. The pipe is cast in four, double, circular pits served by eight cranes and in two square pits wheel flanged and bell and spigot pipe is made. Two of the circular pits are constructed for the production of 16-foot lengths and two for 12-foot, the latter being produced in diameters as great as 24 inches. Operations are carried on in 9-hour shifts and the task system prevails. By this plan of operation, when a shift has done a given amount of work the men are at liberty to go home, but if a shift works sufficiently fast and efficient and produces more than its alloted task, each man on the shift is paid a pro rata bonus on each extra pipe, according to his regular rate. On the other hand, if the output of the shift falls below its allotted task, no reduction is made from their wages. The task system first serves as an incentive for the men to complete their task and to be relieved from further work for the day, and second, it keeps their output at the highest possible point for the bonus money involved. The shift, while at work, is kept informed of its losses, so that these can be replaced with good pipe to complete the task. For example, a 6-inch pit may have for its task 103 pipes per shift. When the 103 pipes are made the day's work is done, regardless of what the time may be when the task has been completed. If the men of the

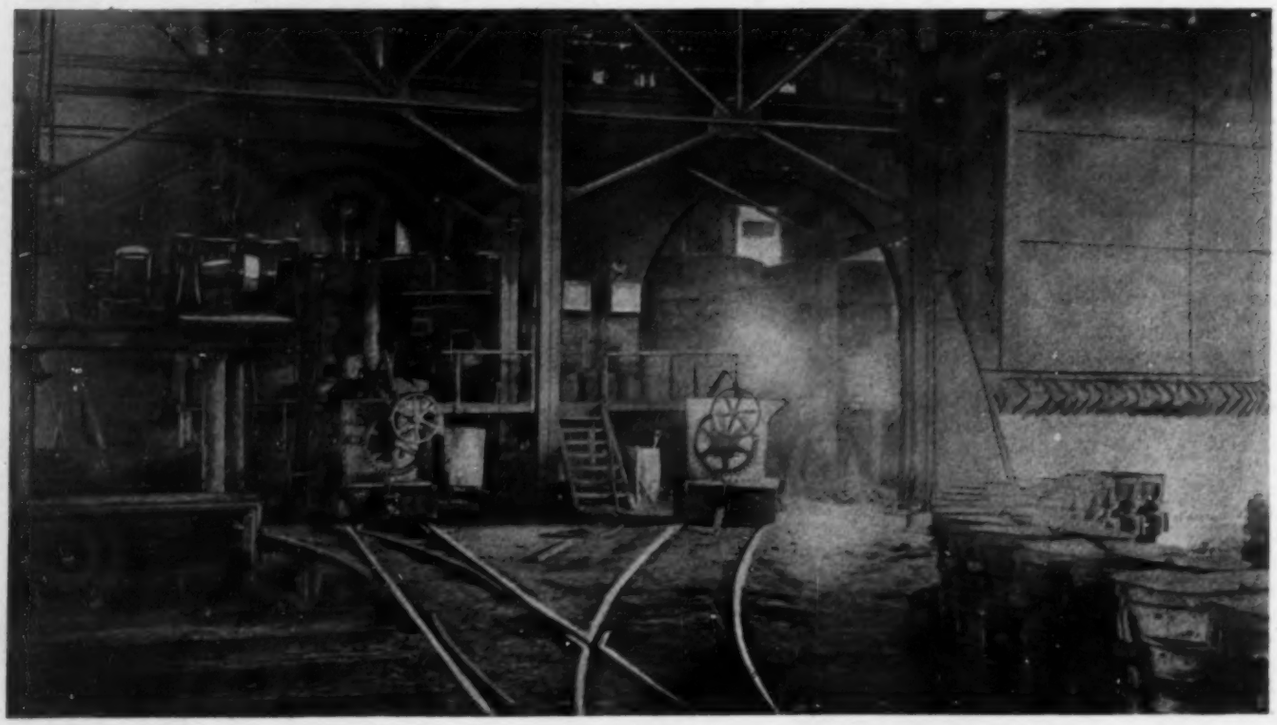
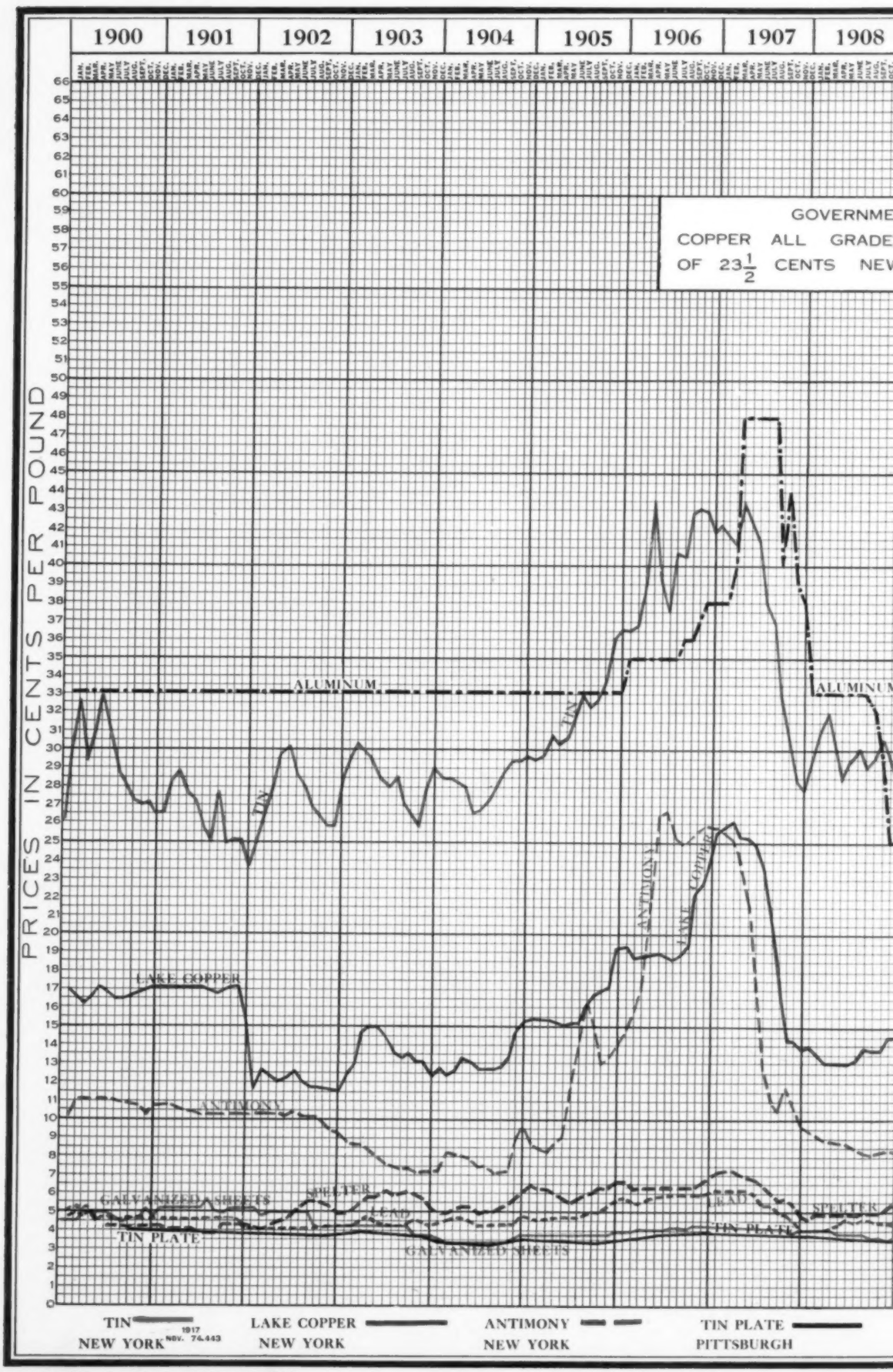


FIG. 5—THE FOUR LARGE CUPOLAS AND THE METAL DISTRIBUTING TRACKS

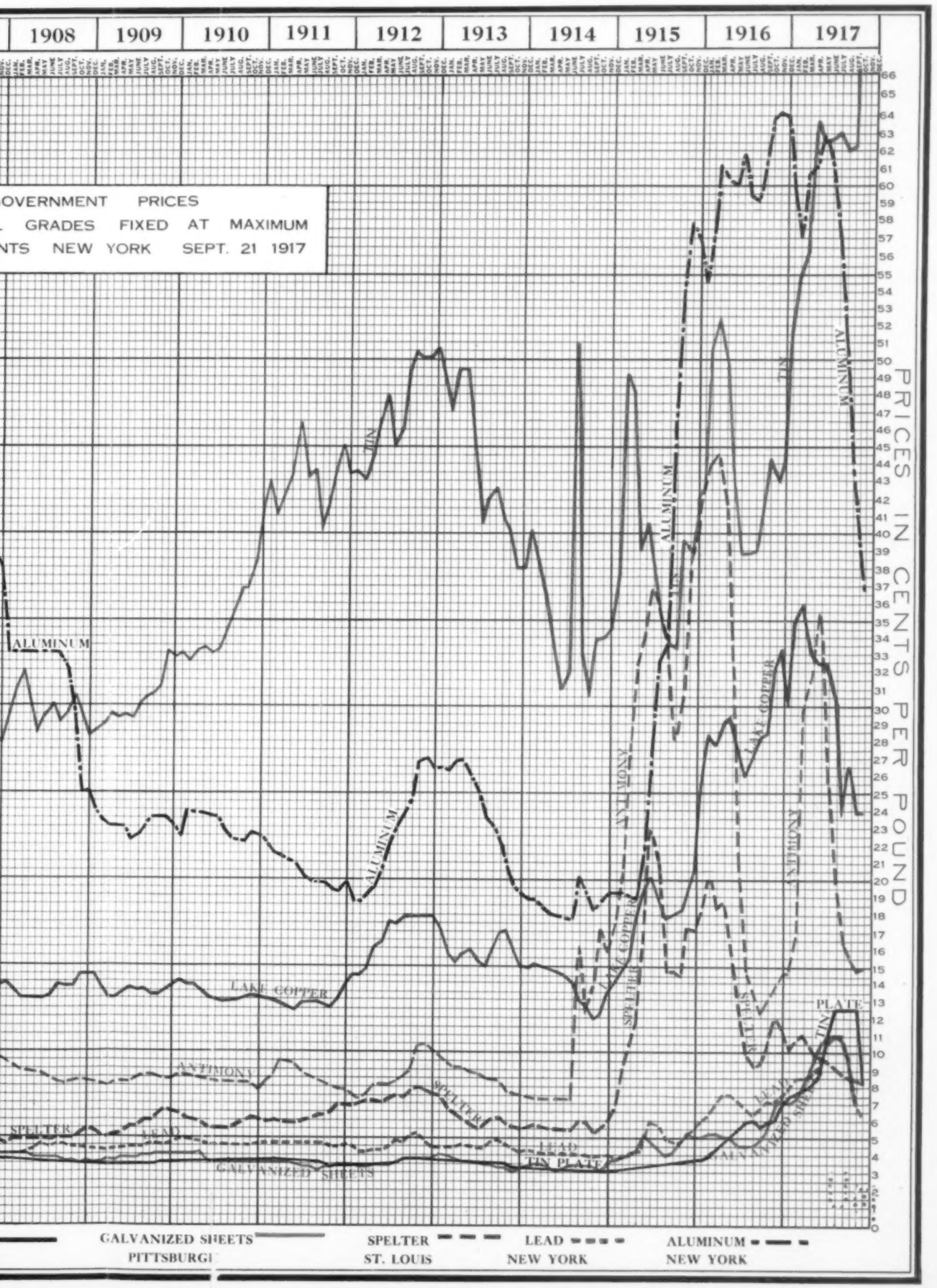
THE IRON TR

Fluctuations in prices of pig tin, aluminum, antimony, lake co



TRADE REVIEW

lake copper, spelter, lead, tin plate and galvanized sheets, 1900-1917



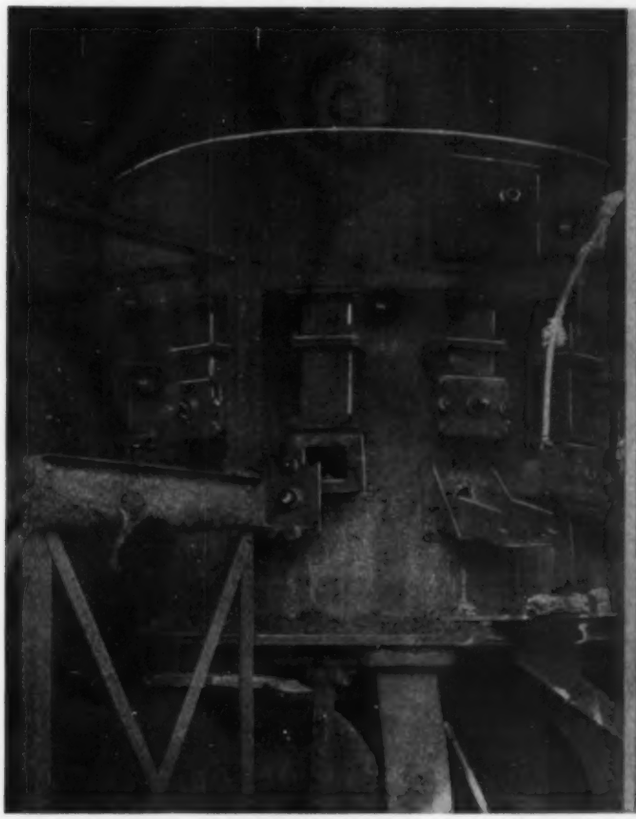


FIG. 6—THESE TUYERES ARE OF THE STEEL WORKS TYPE AND ARE RARELY SEEN IN USE ON FOUNDRY CUPOLAS

FIG. 7—THE HOT METAL BUGGY LADLE DELIVERS MOLTEN IRON FROM THE BLAST FURNACE TO THE FOUNDRY

shift care to and have time to make additional pipe before the next shift comes on the pit, each man of the shift receives a bonus for each extra pipe made. It will be assumed that a workman on a shift is earning $3.09 a day, which is equivalent to 3 cents per pipe for the task of his shift; then if 10 extra pipe are made, he will receive a bonus of 30 cents, or a total day's wage of $3.39. The task system has been worked out in great detail and is

FIG. 8—SCRAP DISTRIBUTION IN THE CUPOLA IS FACILITATED BY CHARGING THROUGH UPPER DOORS

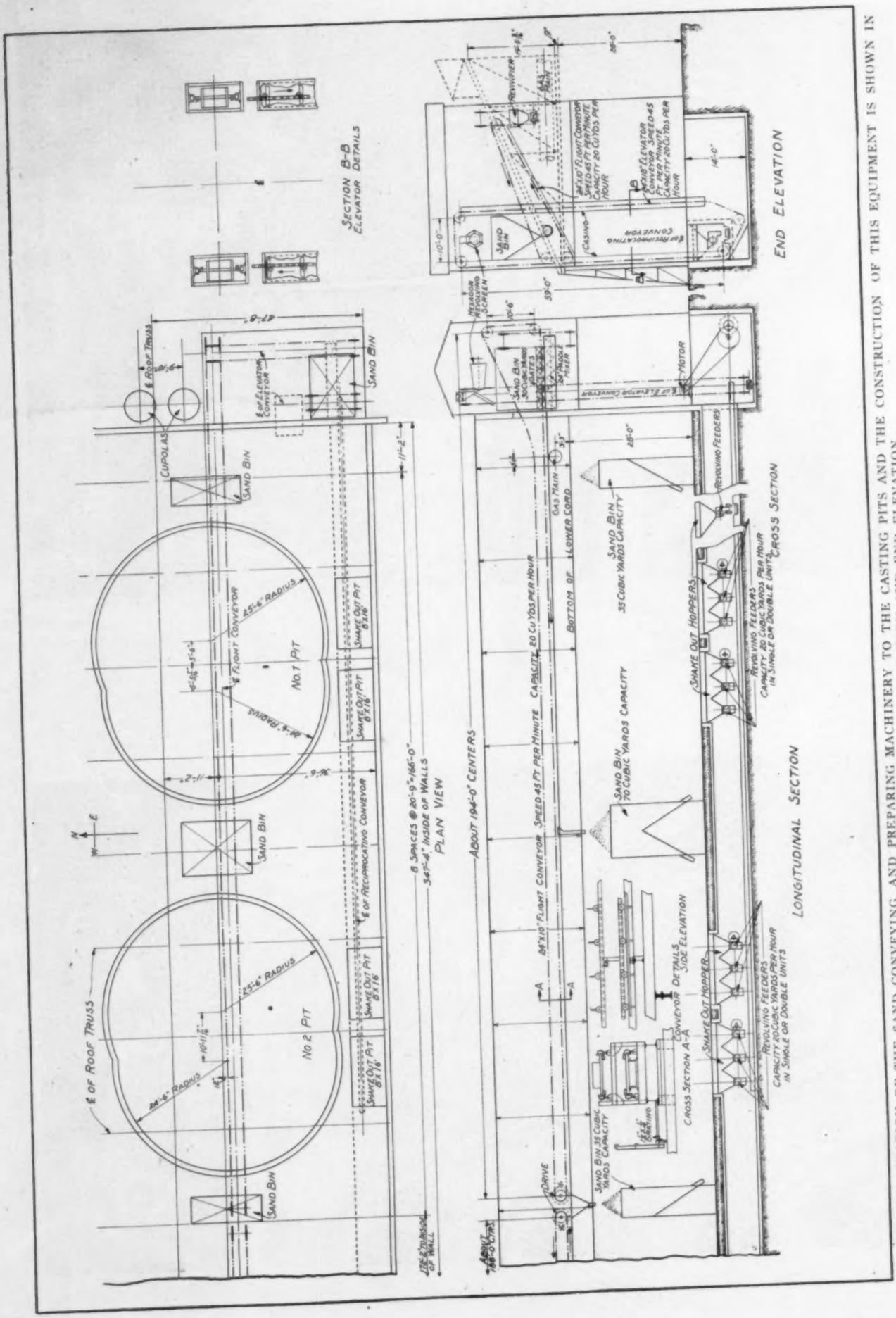


FIG. 9—THE RELATION OF THE SAND CONVEYING AND PREPARING MACHINERY TO THE CASTING PITS AND THE CONSTRUCTION OF THIS EQUIPMENT IS SHOWN IN PLAN, LONGITUDINAL SECTION AND END ELEVATION

applied if possible to every operation.

As previously stated, one of the greatest innovations made in the art of casting pipe, was introduced successfully at this plant about six months ago. While it involved the building of a hot metal track to connect with the mine-to-furnace railroad of the Thomas furnaces of the Republic Iron and Steel Co., this enormous expense has been more than justified by the accruing results. Daily, four ladles, containing about 18 tons of hot metal each are delivered to the foundry from each of the four casts of one of these blast furnaces. The hot metal is mixed in the large tapping-out ladles with the cupola iron and fortified with a knowledge of the analysis of the metal from the furnace, the cupolas can be charged to obtain almost any desired mixture. Since the output of the furnace may vary considerably, at times from cast to cast, one of the chemists from the

FIG. 10—THE REVIVIFIER—AN ESSENTIAL PART OF THE SAND-PREPARING MACHINERY

pipe plant makes a test analysis of every cast at the furnace. The results are telephoned immediately to the foundry where the charges are made up to conform to the analysis desired for the pipe. In this way, the mixtures are controlled and small additions of the hot metal are made to each ladleful of cupola metal.

Aside from maintaining a high standard of metal the saving in the cost of melting approximately 70 tons of metal daily was no small economy when coke was selling at $16 a ton and was obtainable only spasmodically.

Temporarily, at least, it is not intended to increase the consumption of hot metal, but plans are under consideration which will further advance and improve this practice materially. A view of one of the hot metal ladle cars on the depressed track on which it is delivered to the foundry is illustrated in Fig. 7. For pouring the metal into the cupola ladles the back end is tilted by a chain operated by a trolley. Metal is melted in four cupolas of large size, two being 84 inches in diameter, and two, 72 inches. Since the plant is operated two shifts, two of the

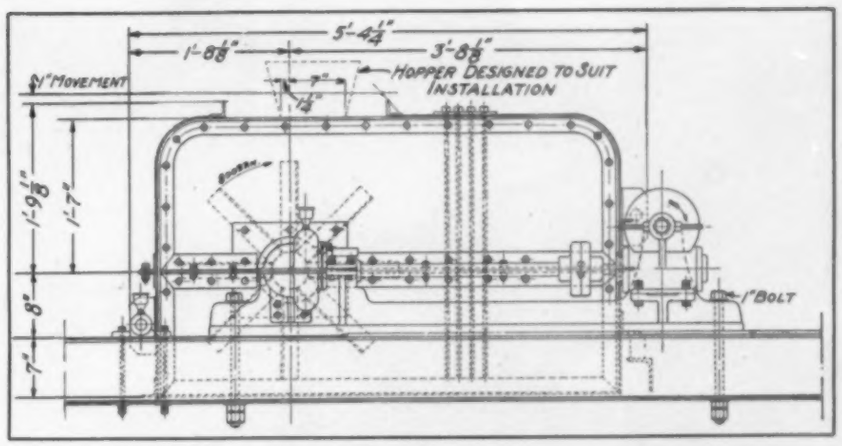


FIG. 11—SIDE ELEVATION OF THE SAND REVIVIFIER

cupolas are in blast from 5 a. m. to 3 p. m., and the other two from 5 p. m. to 3 a. m. This makes a total of 10 hours for each furnace, and notwithstanding the duration of the heats no difficulty is experienced from the stock hanging in the stacks. The cupolas are slagged continuously, a practice that may be followed to advantage by foundrymen making long heats. A view of the four cupolas is illustrated in Fig. 5, which shows the tracks for distributing the metal and the switch at the side leading to the depressed track where the hot metal charges are obtained.

Each cupola is equipped with two rows of six tuyeres and their unique construction, so far as foundry practice is concerned, is illustrated in Fig. 6. Tuyeres of this type are installed on cupolas furnishing molten iron to bessemer steel plants and owing to their known efficiency these furnaces were so equipped. For the purpose of facilitating the distribution of scrap charges, two of the cupolas, Fig. 8, each have been provided with two sets of charging doors. The scrap is charged through the upper doors, as shown from pans filled in the yard. The pan, loaded with scrap, is elevated to the charging floor, where it is deposited on the high platform car illustrated, which raises the lip of the pan to a level with the lower sill of the charging door. One end of the pan is engaged by a hook suspended from a trolley and the charge is dumped into the cupola.

Preparing the Sand for Pipe Molds

Contributing to the efficiency of the foundry in the production of an improved quality of pipe and in the reduction of casting losses, is the sand-preparing and conveying plant. Two of the four double casting pits now are being served in this way and all of the difficulties involved in tempering and handling so great a volume of sand as used in a pipe shop have practically been eliminated by this equipment which was installed by the Link-Belt Co., Chicago. One of the chief obstacles to the success of sand conveying machinery in continuous or semicontinuous casting plants is the inability to return

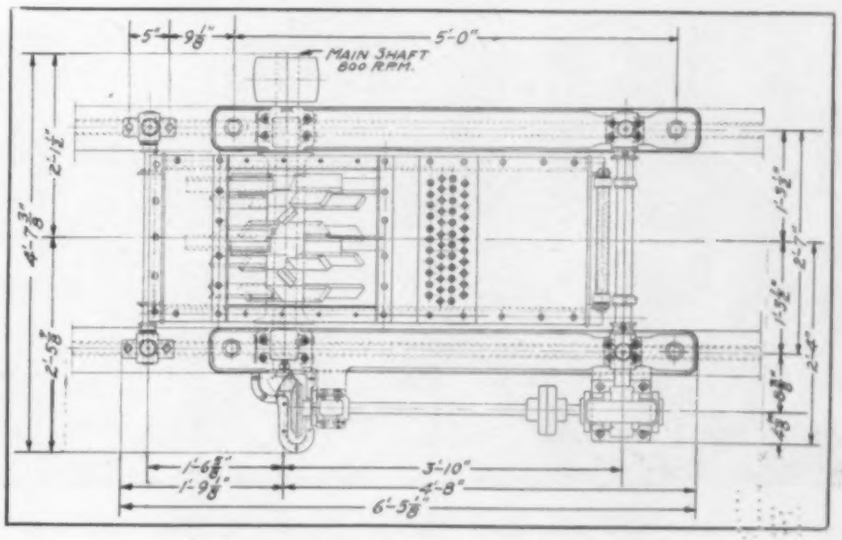
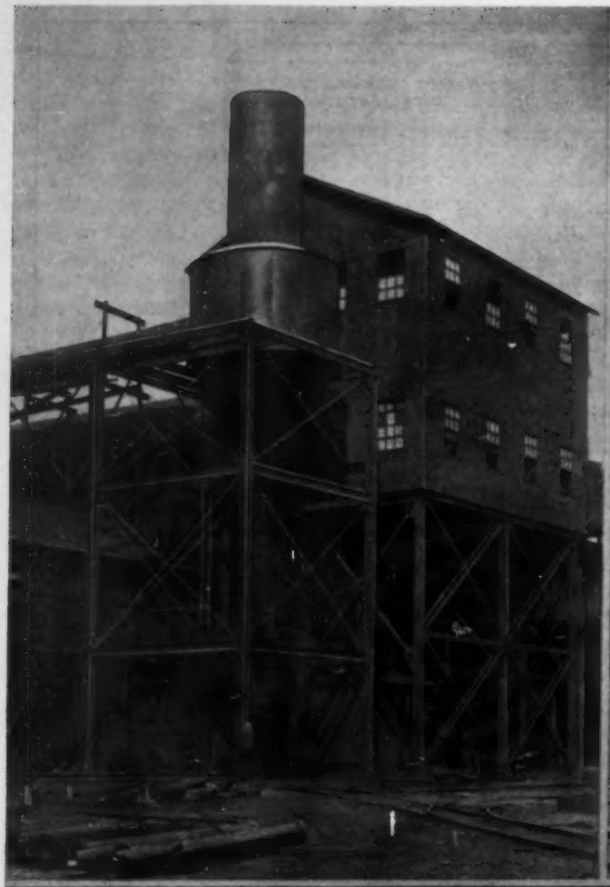
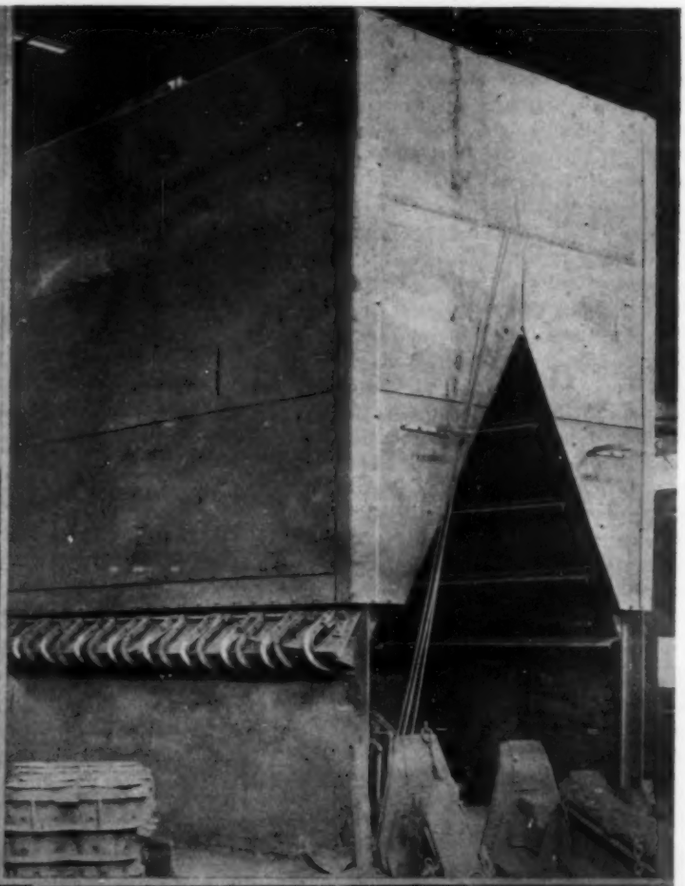
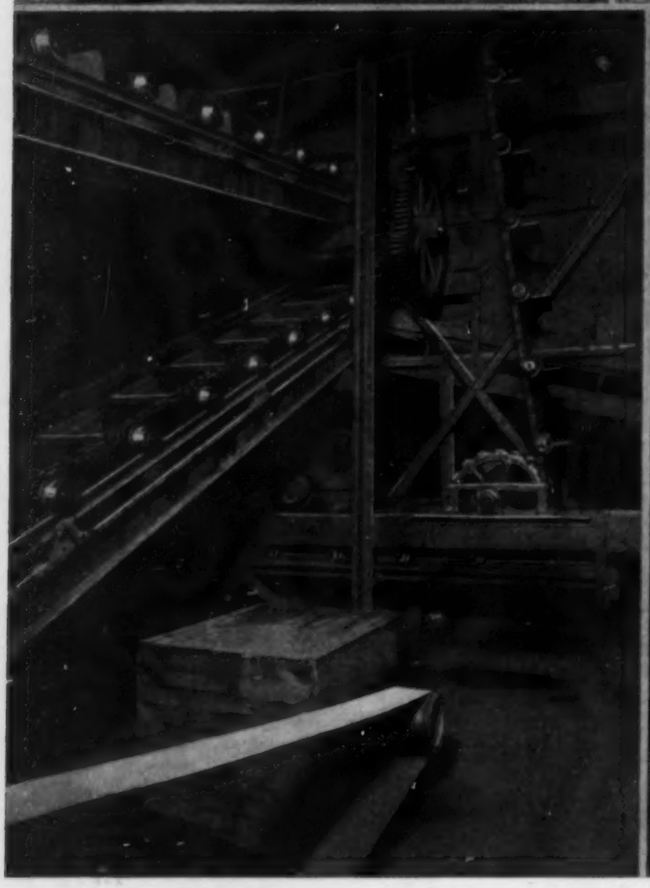


FIG. 12—PLAN VIEW OF THE SAND REVIVIFIER







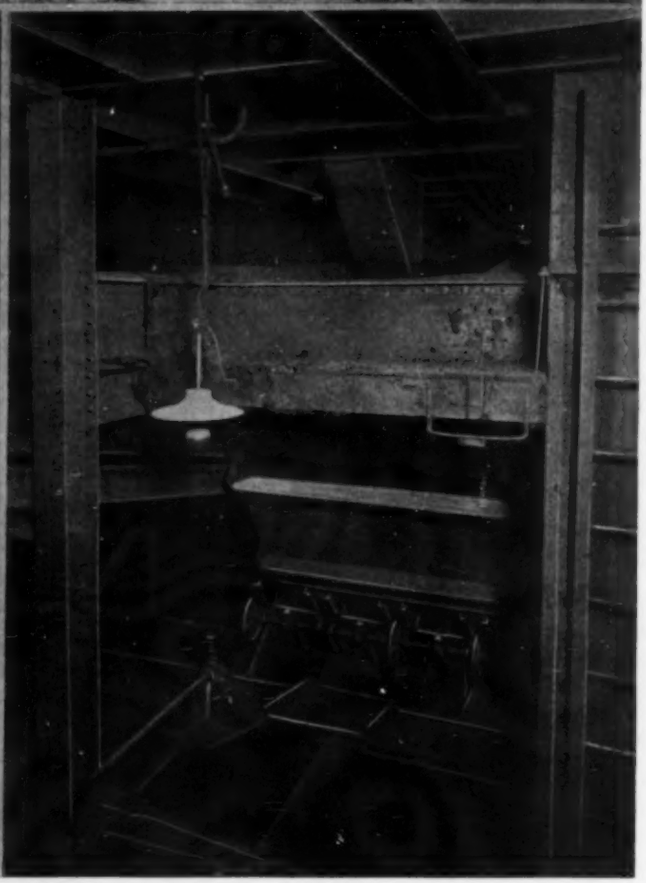


FIG. 13—THE SAND-PREPARING PLANT AND DUST ARRESTER

FIG. 14—THIS DOUBLE SAND BIN SERVES TWO CASTING PITS

FIG. 15—UPPER RUN OF THE FLIGHT-CONVEYOR-ELEVATOR DISCHARGES SAND INTO THE REVOLVING SCREEN

FIG. 16—SAND BIN EQUIPPED WITH GATES FOR DISCHARGING CONTENTS INTO THE PADDLE-CONVEYOR-MIXER

the material to the molding floors in a sufficiently cool condition for repeated use, and in a pipe foundry, where the sand is heated to redness when shaken-out, this problem is an unusually difficult one to solve. This equipment, however, has been constructed sufficiently large in all of its parts to allow an ample period to elapse from the time the sand falls into the shake-out hopper until it is returned to the molder to enable it to cool and be in prime condition for ramming. The sand makes a complete circuit in about 24 hours and its cool condition when delivered to the floors is greatly appreciated by the men, particularly in this southern climate in the summer time.

A complete layout of the sand-handling

FIG. 17—REVOLVING FEEDERS UNDERNEATH THE SHAKE-OUT HOPPERS

and preparing machinery, showing its relation to the two double pits which it serves, is presented in Fig. 9. Briefly described, the hot sand falls into shake-out hoppers over which the flasks are opened, the pipe being skidded on horses to the cooling racks. The hoppers have gratings at the floor level to prevent clamps, etc., from passing through with the sand which is very hot and is delivered by automatic feeders into a reciprocating conveyor. Some water is added to the sand in the conveyor to cool it and reduce the dust. The sand is delivered to the sand-preparing house, where it is discharged into a special elevator and this, in turn, delivers it to a hexagonal screen that removes any small pieces of iron or other foreign

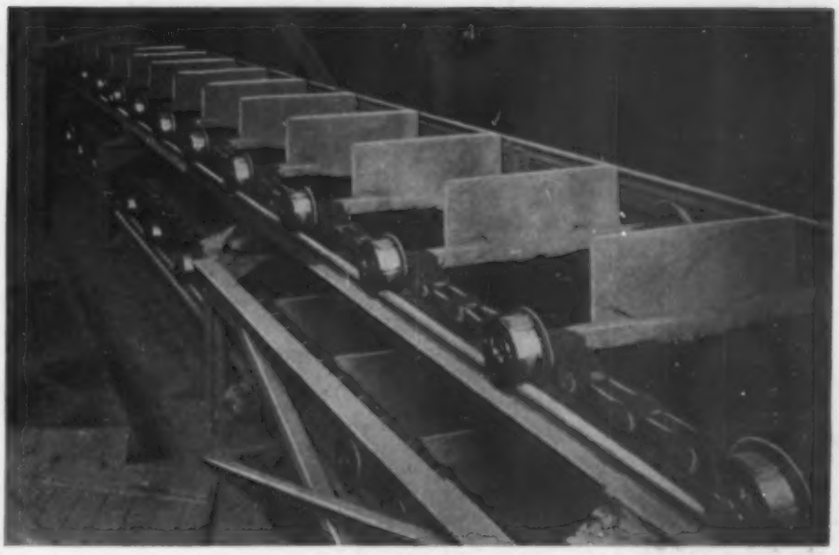


FIG. 18—PREPARED SAND IS DELIVERED TO BINS BY THE OVERHEAD CONVEYOR

matter which might have passed through the grating over the shake-out hoppers, and drops the sand into a bin. From the latter it is fed, as required, into a paddle mixer, to which the proper amount of claywash is added to impart the proper temper to the sand. The paddle mixer delivers it to an inclined flight conveyor which feeds the tempered sand into a revivifier where it is aerated and thoroughly mixed. Any remaining clods of sand are broken up and a thoroughly mixed product is delivered to the storage bins in front of the pits where the molds are rammed. These bins are provided with a series of over-cut gates extending across the whole front, so that the sand can be delivered wherever most convenient for the men who shovel it into flasks.

The proximity of the larger double sand bin to the adjoining casting pits is illustrated clearly in Fig. 1, and in the foreground is the grating through which the sand falls into the shake-out hopper. The operation of shaking-out a pipe onto the horses is shown in Fig. 2. After knocking off the clamps, the longitudinally-hinged flask is opened by crane hooks engaging loops on either side, dropping out the pipe casting and the molding sand.

Details of Sand-Handling Machinery

A plan view of the sand-handling machinery, together with a longitudinal section and an end elevation, are shown in Fig. 9. It will be noted that the three shake-out hoppers under each grating are equipped with revolving feeders that have a capacity of 20 cubic yards per hour. The reciprocating conveyor which travels in a concrete tunnel under the foundry floor, is about 160

FIG. 19—END OF RECIPROCATING CONVEYOR AND BOOT OF ELEVATOR

feet long. The 24 x 10-inch flight conveyor which travels overhead at a height of 32 feet above the foundry floor operates at a speed of 45 feet per minute and has a capacity of 20 cubic yards per hour. Each of the two double casting pits is served by two sand bins with a capacity of 35 cubic yards each. Between the two pits is the double bin illustrated at the right in Fig. 1, and an enlarged view is shown in Fig. 14, which clearly outlines the construction of the over-cut gates.

One of the most essential features of the sand-preparing machinery is the revivifier. The used sand which has been returned through the reciprocating conveyor, elevator and screen, to the storage bins over the mixing machinery, is delivered, as required, through sliding gates, into the paddle conveyor mixer where a suitable combination of clay and water is added and mixed before it drops to the inclined conveyor that delivers it into the receiving hopper of the revivifier. Fig. 11 is a side elevation of the revivifier, Fig. 12 is a plan view, and the enclosed machine with a chute leading into it from the sand

FIG. 20—EVERY COMFORT FOR THE NEGRO EMPLOYES IS PROVIDED BY THESE HOUSES; FIG. 21—THIS IS A FIVE-ROOM COTTAGE IN THE NEGRO SECTION THAT RENTS FOR $15.00 PER MONTH; FIG. 22—ONE OF THE STREETS OF THE NEGRO VILLAGE WHICH HAS BEEN NEWLY LAID OUT TO PROVIDE FOR NEW EMPLOYES

receiving hopper is illustrated in Fig. 10.

The main shaft of the revivifier operates at 800 revolutions per minute and is equipped with flat steel beater arms, set at such an angle that they drive two streams of sand forward across each other and across the center line against the curtain of suspended, ½-inch round rods, staggered in four rows in a position which does not permit any particles to pass through in a straight line. The violence of impact breaks any remaining lumps of sand, the open curtain of rods prevents the formation of currents of air swirling around the shaft and the streams of sand crossing each other thoroughly mix the particles.

To prevent moist sand from accumulating on the rods and on the inside of the casing, it is so arranged that the casing and suspended rods shall receive 10½ jolts per minute, by hinging the rear of the casing. The front end is raised by cams and dropped on a wooden bumper at every turn of the camshaft. The bottom of the casing being open, discharges the prepared sand onto a conveyor which delivers it to storage bins.

FIG. 23—STREET SCENE IN THE VILLAGE FOR WHITE EMPLOYES. THE HOUSES ARE OF A SUBSTANTIAL CHARACTER AND PROVIDE EVERY FAMILY COMFORT; FIG. 24—ONE OF THE MORE PRETENTIOUS HOUSES OCCUPIED BY ONE OF THE PLANT EXECUTIVES; FIG. 25—REAR VIEW OF A ROW OF HOUSES IN THE NEGRO VILLAGE. THE BACKYARDS ARE AMPLE IN SIZE FOR VEGETABLE GARDENS FOR ONE FAMILY

Fig. 13 is a view of the sand-preparing plant built outside of the foundry. It rises to a height of over 60 feet. The dust collector, extending above the top of the house, is in the foreground. The upper run of the flight conveyor-elevator is illustrated in Fig. 15; it discharges into the revolving screen over the sand bin. At the foot it receives sand brought from the casting pits by a reciprocating conveyor. Fig. 16 is the sand bin provided with gates for discharging into the paddle conveyor-mixer. It delivers the sand to an inclined apron conveyor which feeds the molding-sand revivifier. The revolving feeders that deliver the sand to the reciprocating conveyor from the shake-out hoppers are illustrated in Fig. 17, and Fig. 18 is a section of the overhead conveyor that takes back the sand from the revivifier to the bins at the casting pits. Fig. 19 is the boot of the elevator that delivers the sand to the hexagonal screen from the end of the reciprocating conveyor in the concrete tunnel.

FIG. 26—THIS MEDICAL DISPENSARY OPERATING ROOM WOULD GRACE ANY METROPOLITAN HOSPITAL

In conjunction with the pipe shop, a large foundry is operated for the production of fittings, special castings, etc. It has an output of approximately 200 tons per month. Operations are facilitated and economies effected by the use of cast-iron flasks shaped to conform to the contour of the castings made in them, thereby reducing the amount of sand required and embodying the other well-known advantages of such metal equipment. Special rigging also has been devised to expedite the molding, core-making and shaking-out operations. These rigs reflect great ingenuity in their design and construction. Jar-ramming machines are employed for making the molds and the flasks are equipped with roll-up hinges which facilitate the drawing of the patterns and the closing of the molds. In Fig. 30 is illustrated a green sand mold and core for a tee made in a roll-up hinge flask and a floor of such molds in process of shaking-out is illustrated in Fig. 29. The operation of jar-ramming a fitting is shown in Fig. 32. A frame is set on top of the flask for holding additional sand while ramming and this is removed when the flask is struck-off. In addition to ramming molds, the large jarring machine is employed for shaking-out the flasks, as shown in Fig. 31. A cast-iron frame is set on top of the table, being recessed at the corners for directing the flow of sand to the floor. The operation of uncovering the molds is as speedy as it is simple. After removing the clamps from the flasks, two molders pass two chains from the crane underneath the corners of the cope flask, and in succession they place the lifted cope from one flask onto the neighboring flask from which the cope is to be lifted. This operation is repeated until the chain slings are filled, the number being measured by the size of the flasks. In Fig. 29, it will be noted, three cope flasks are in the slings ready to be conveyed to the jar-ramming machine for shaking-out and the castings that have been uncovered are in the foreground.

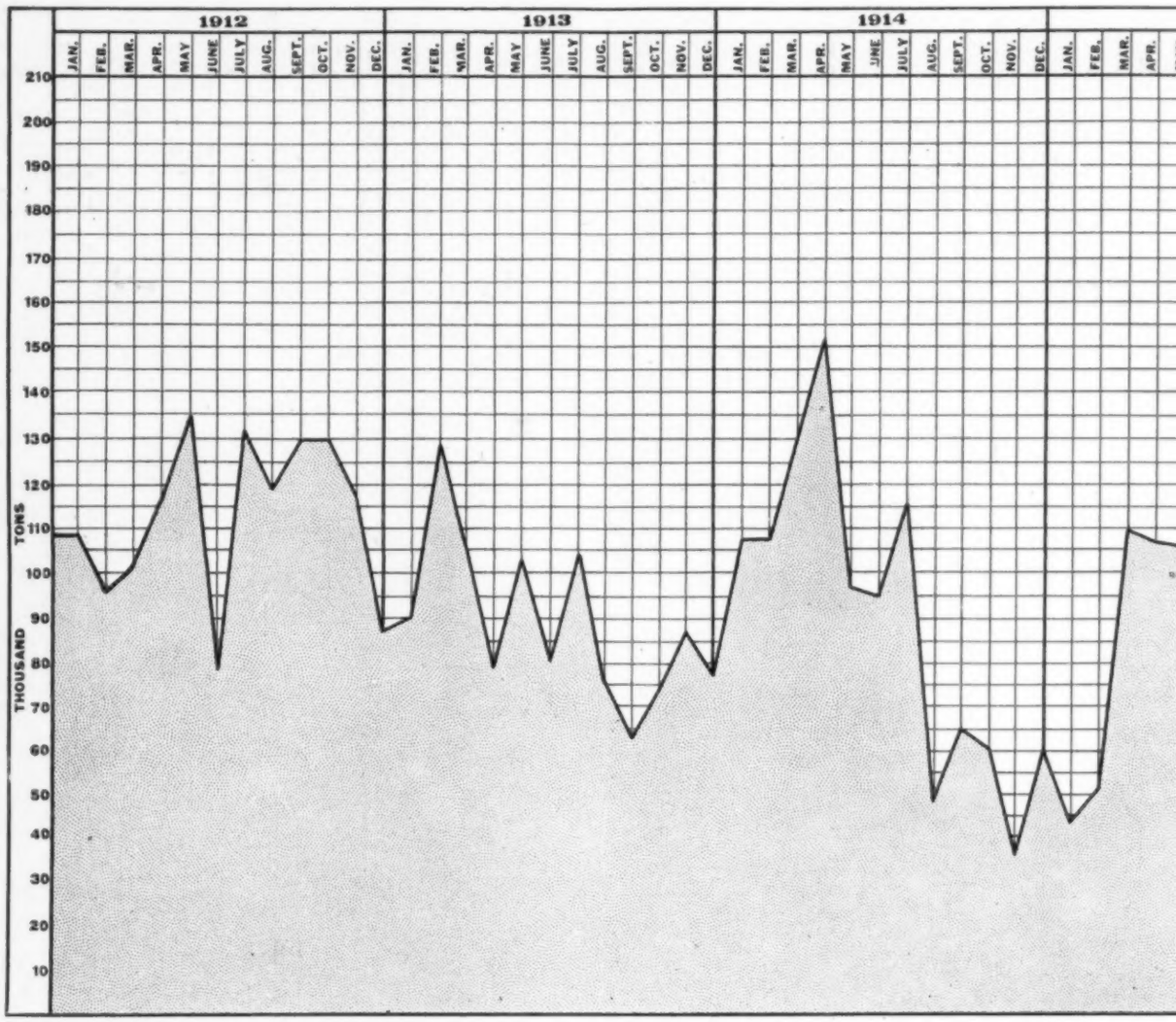
The method of making the cores for fittings is another interesting operation. The hinged core boxes are set on cast iron frames where the cores are rammed by hand. In Fig. 33 the core box for a tee is in open position for making the core. The cast iron core arbor is in place and after ramming both halves, the core box is closed and the upper half is rolled back into its original position.

The kinship that exists between the man who employs and the man who works receives full recognition at the plant of the American Cast Iron Pipe

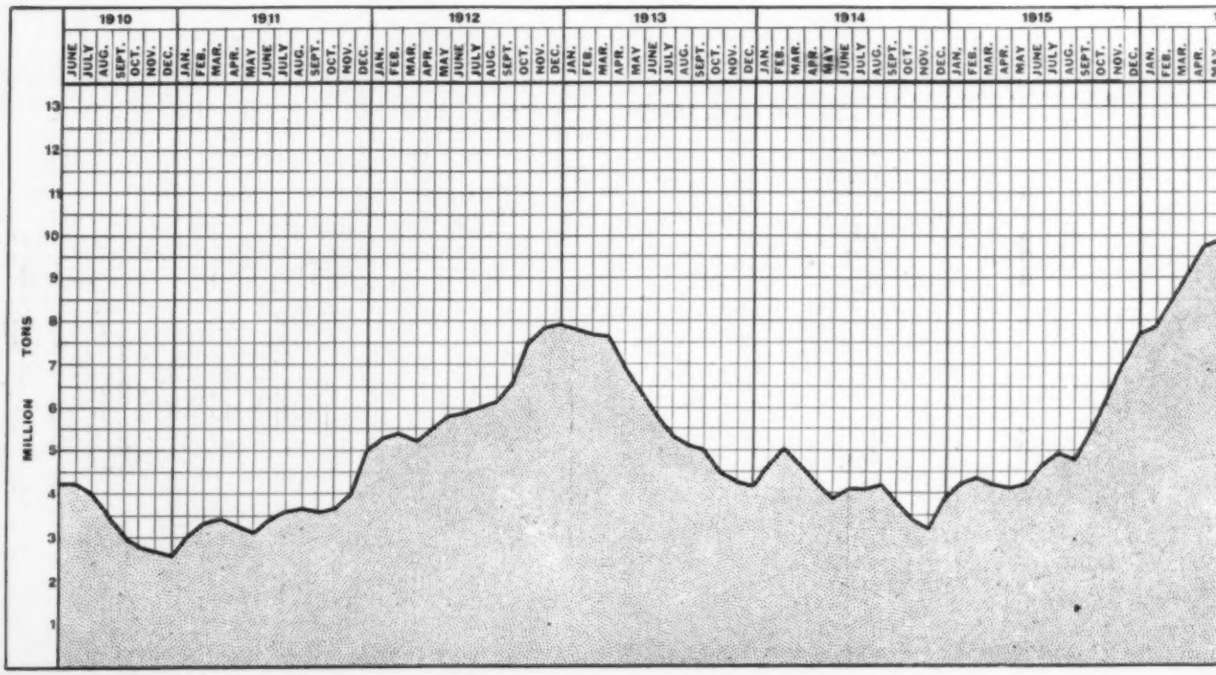
FIG. 27—THE DOMESTIC SCIENCE SCHOOL BUILDING IN THE NEGRO VILLAGE

FIG. 28—ANOTHER STYLE OF ARCHITECTURE IN THE NEGRO VILLAGE

Charts showing monthly structural awards, production of pig iron



FABRICATED STEEL AWARDS BY MONT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MONTHLY UNFILLED TONNAGE UNITED STATES STEEL CORP. 1910-1917

THE IRON TRADE REVIEW

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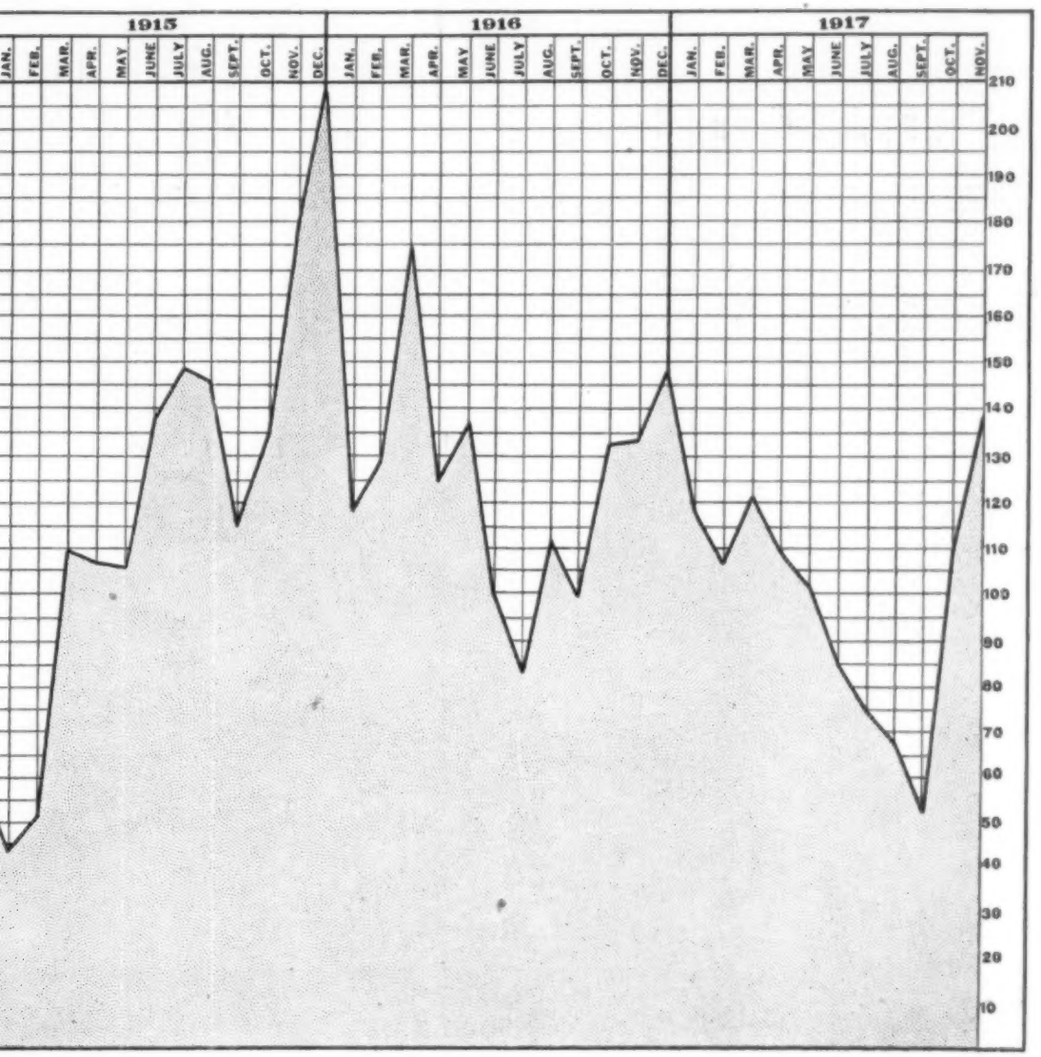

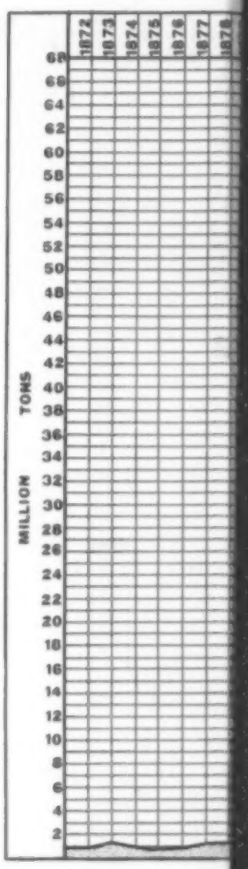

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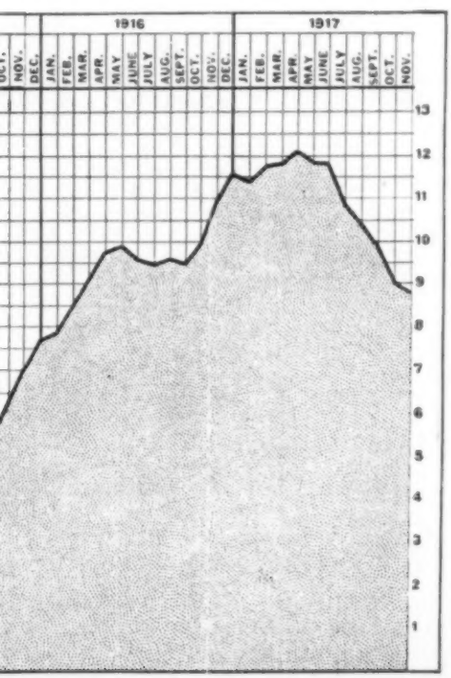

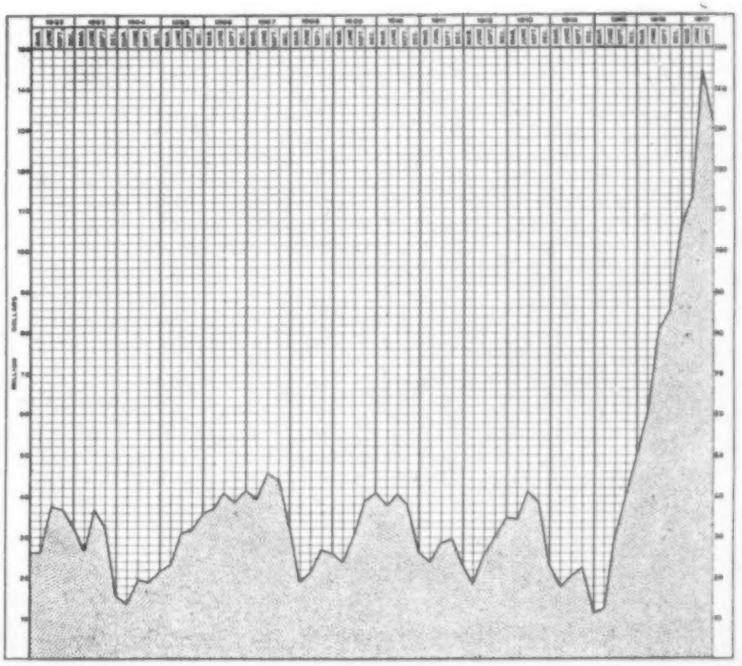

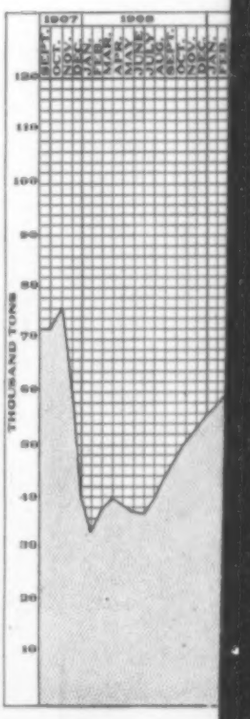

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NET EARNINGS BY QUARTERS UNITED STATES STEEL CORP. 1902-1917

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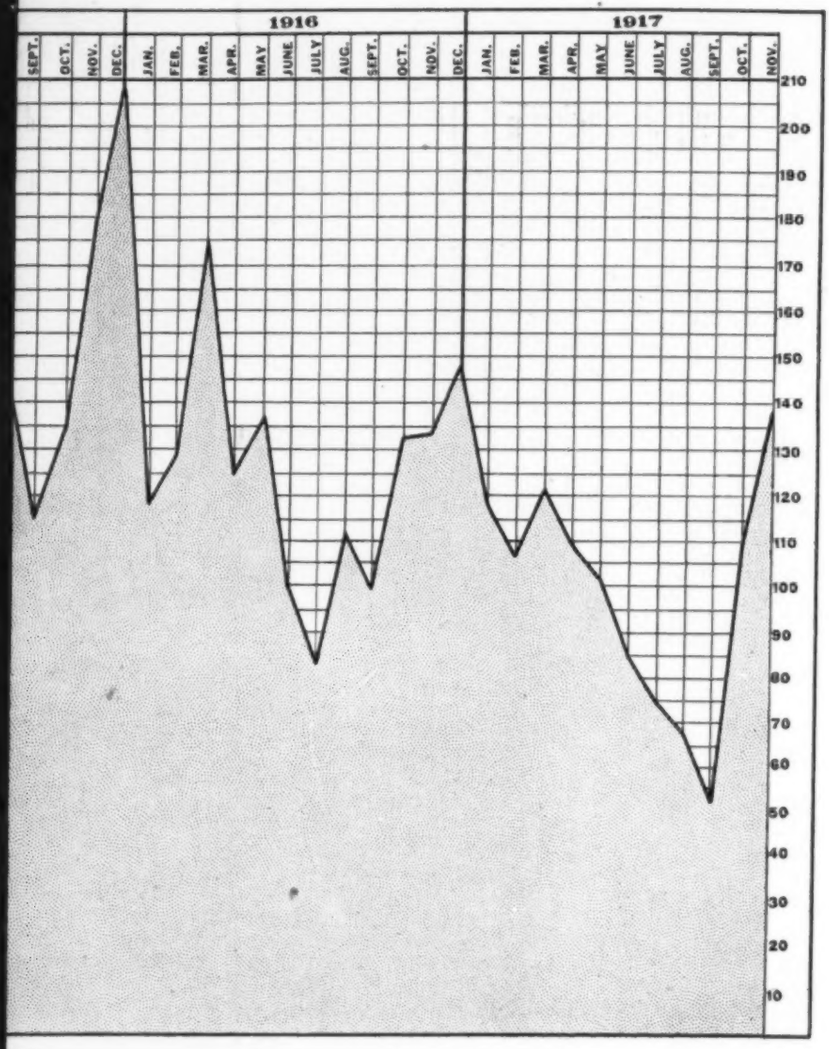

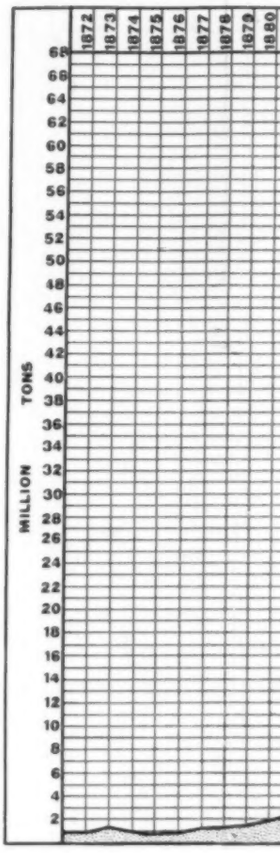

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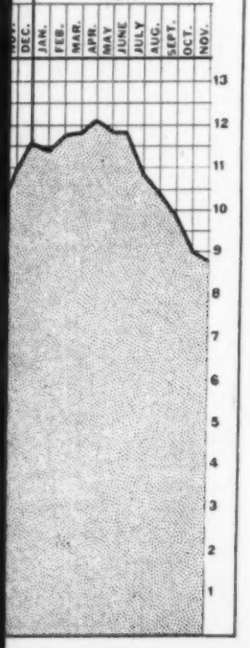

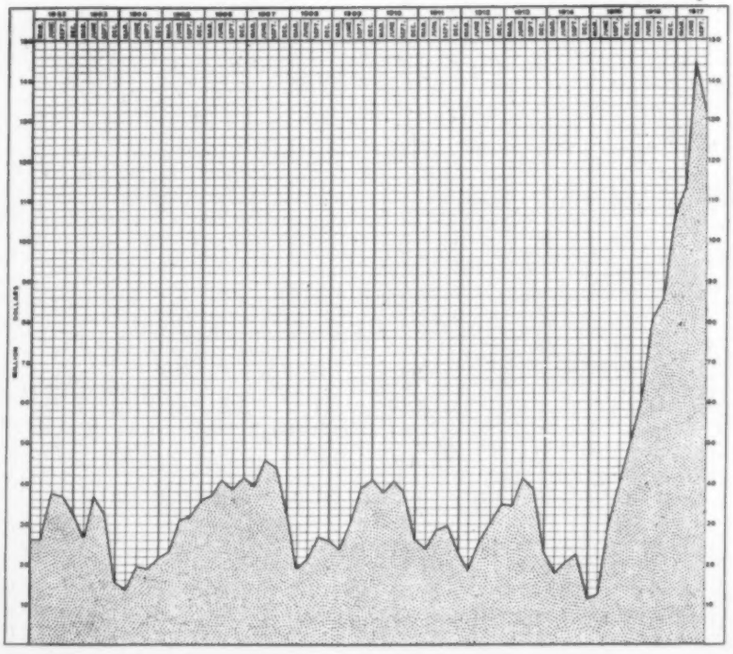

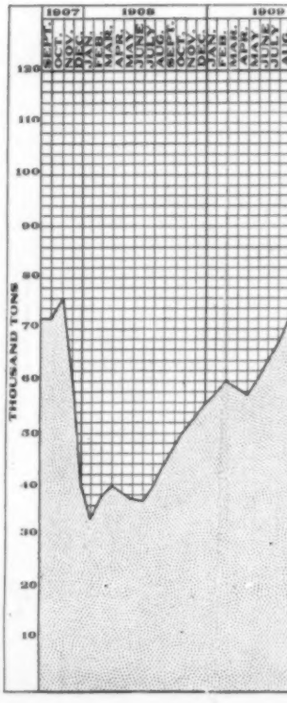

NET EARNINGS BY QUARTERS UNITED STATES STEEL CORP. 1902-1917

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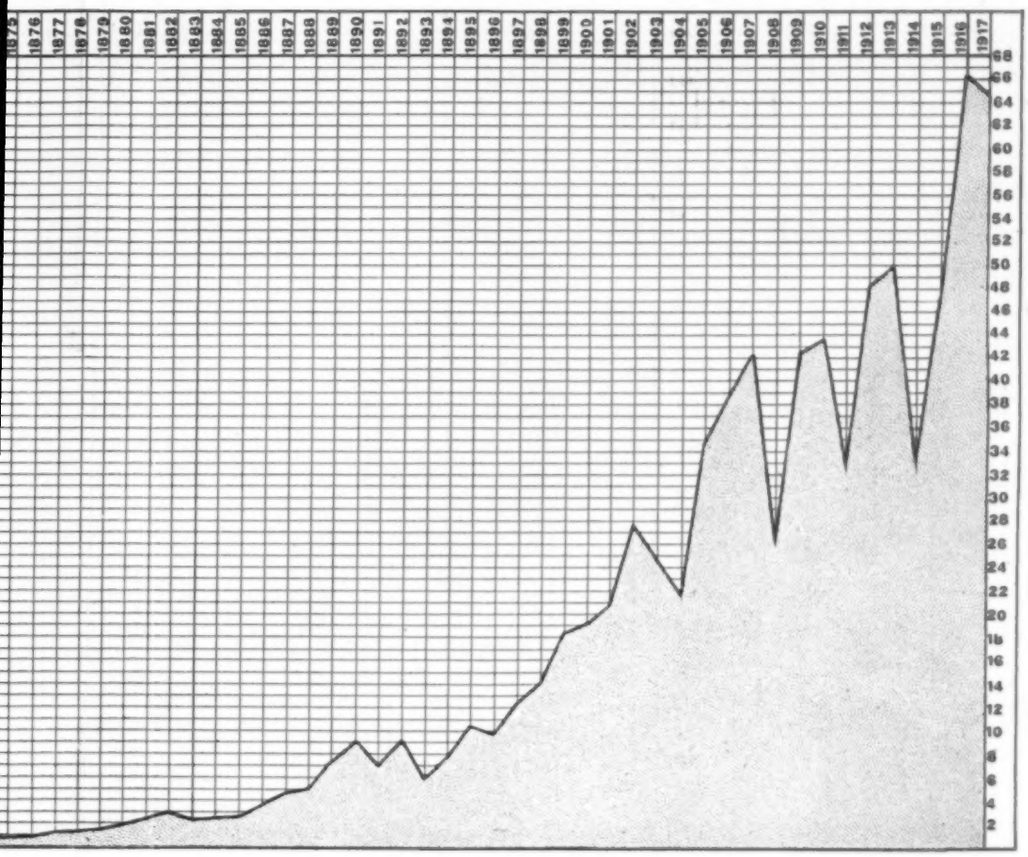
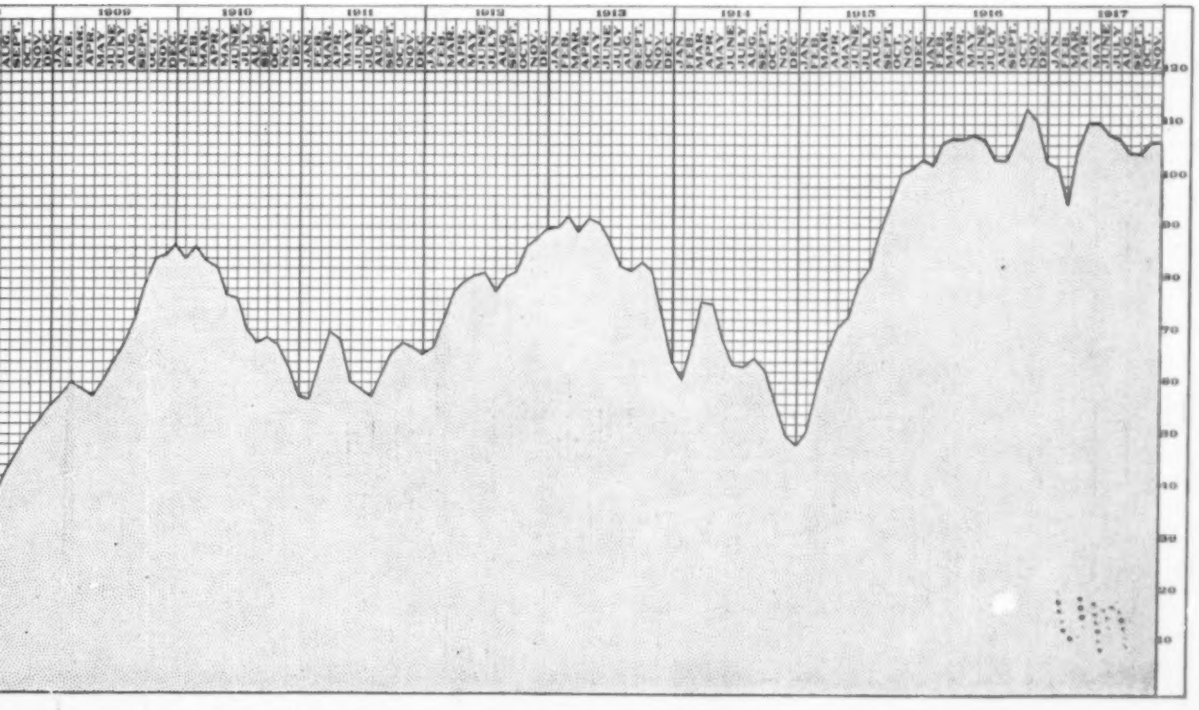


SEASON'S SHIPMENTS LAKE SUPERIOR IRON ORE 1872-1917



DAILY AVERAGE PRODUCTION COKE AND ANTHRACITE PIG IRON SEPTEMBER, 1907 TO DECEMBER, 1917

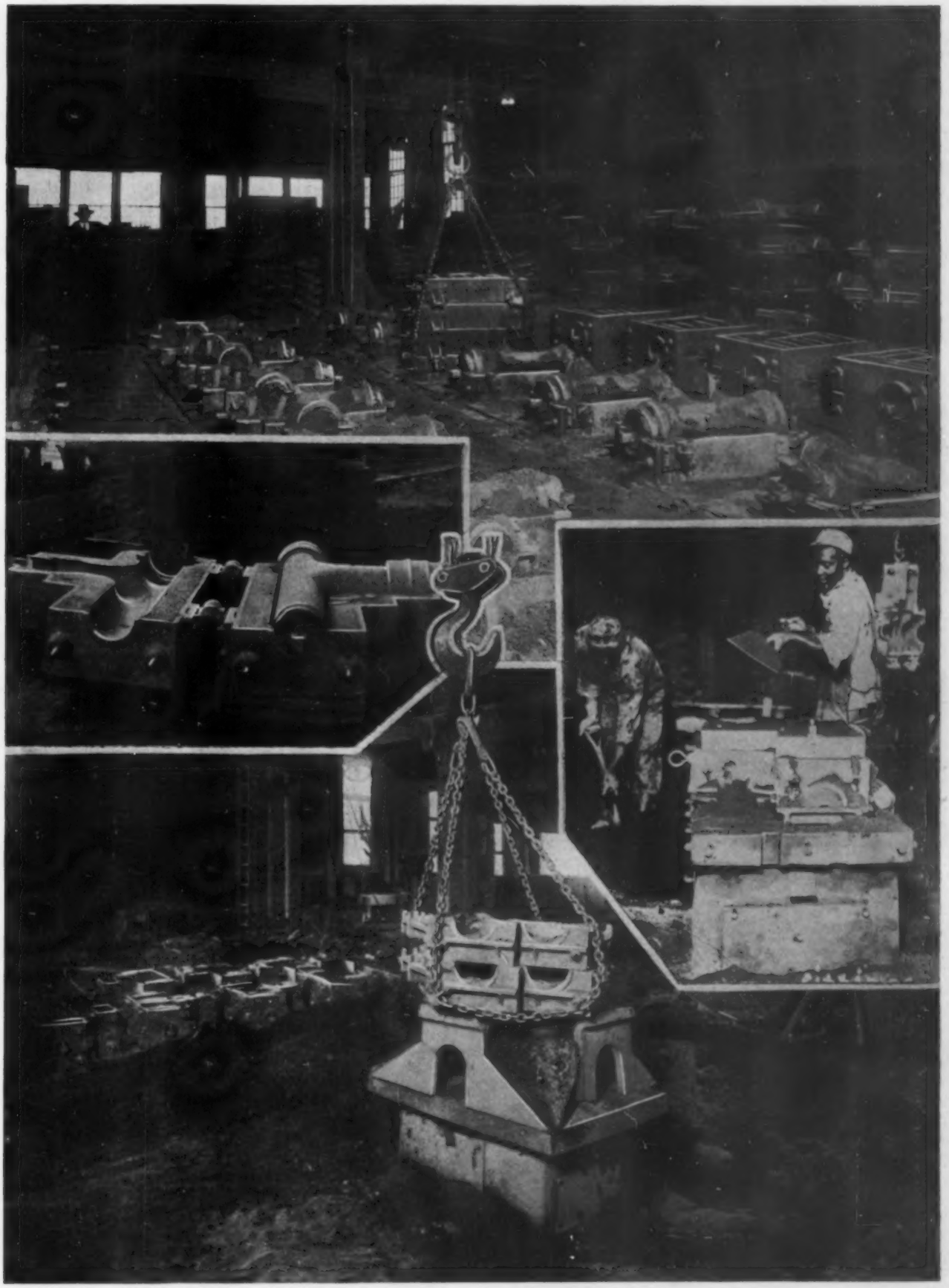


FIG. 29—UNCOVERING MOLDS BY LIFTING OFF COPE FLASKS IN SUCCESSION AND CONVEYING THEM BY CRANE TO THE JAR-RAMMERS FOR SHAKING-OUT

FIG. 30 — ROLL-UP HINGE ON FLASK OF GREEN SAND MOLD AND CORE

FIG. 31—UTILIZING THE JAR-RAMMER FOR SHAKING-OUT AS WELL AS RAMMING

FIG. 32 — MOLDING FITTINGS BY MEANS OF A JAR-RAMMING MACHINE

Co. Three-fourths of the laborers in this shop are negroes who have been found to be as dependable as any class of labor, and in making them so, the pick-handle method never has been employed. Probably in no line of work will men get as dirty as in a pipe foundry and the bathhouse provided for all of the employes is liberally patronized. During a period of 12 months, from Oct. 1, 1915, to Sept. 30, 1916, the negro employes took 166,477 baths and the white employes, 25,753. It is claimed that with the negroes the bathing habit is infectious and is communicated to their families and friends. Medical and dental service is provided for every employe and his family on a co-operative basis and every applicant for a position is given a thorough physical examination. If any condition is present that might endanger the health of other employes, the applicant is refused a position. The medical service rendered is in striking contrast to that of the traditional *company doctor*. It insures the men and their families medical attention which they would never get otherwise. The men are kept in good health and at a high degree of efficiency. A benefit association is maintained into which the company pays an amount equal to the dues of its employes. Benefits are paid for illness, injury and death and are awarded by a board of trustees elected from among the ranks of the workmen.

To encourage the white employes to own their own homes, a real estate department is conducted which finances these operations and constructs their houses. Branches of the Y. M. C. A. for the white and negro workmen are maintained with paid secretaries, where restaurants are open night and day to serve meals at cost. Free moving picture shows are given twice weekly and religious, social and athletic activities are promoted and organized. A field secretary operating under the instruction of the Y. M. C. A. daily visits the homes of the employes, advising with the housewives regarding sanitation, health, economy, etc.

Each autumn a negro agricultural fair is held at which numerous contests are scheduled and live stock, agricultural and domestic exhibits are made and cash prizes are awarded. A branch of a local savings bank also is located at the works. A suggestion box is maintained and cash prizes are awarded for the best recommendations. Bonuses are paid the employes based on their yearly earnings.

That Acipco is being developed into a model town of fine homes under the auspices of the company is indicated by the accompanying illustrations. Wide streets in the sections for the white and negro workmen and their families are constantly being opened and new houses are being built. The style of architecture is varied to avoid the sameness of the usual type of company houses. All dwellings, whether for the negro or white population, are provided with toilets and baths, and to enable negroes to obtain greater comforts at lower costs than elsewhere, the houses are rented on the basis of $3 per room per month. The smallest contain three rooms and the largest, five. Recently, during the period of construction of a lot of 50 houses for the negroes, 110 applications were made for these dwellings.

The corner of a street in the negro village is shown in Fig. 20, and Fig. 21 is a view of one of the houses. It will be noted that it is amply provided with windows for light and ventilation and the spacious porch insures comfort during the hot summer season. The varied style of architecture is illustrated in the view of another street of the negro section, Fig. 22. Fig. 23 is a street scene in the section of Acipco for the whites, and Fig. 24 shows one of the more pretentious houses of one of the plant executives. The rear view of a recently laid-out street in the negro village is illustrated in Fig. 25. Spacious yards surround each house where a vegetable garden may be maintained to provide for the needs of a family. A domestic science school building for negroes also has been erected recently, as shown in Fig. 27. A school for negroes also is being built. It will be turned over to the municipality. A community church is being constructed at the present time. The medical department includes a thoroughly equipped operating room, consultation rooms and dental parlors for both races, together with a drug dispensary. This establishment is conducted by two doctors, one a high-class surgeon and general practitioner, and the other a physician; a white trained nurse, two negro trained nurses a dentist and several of the leading specialists of Birmingham.

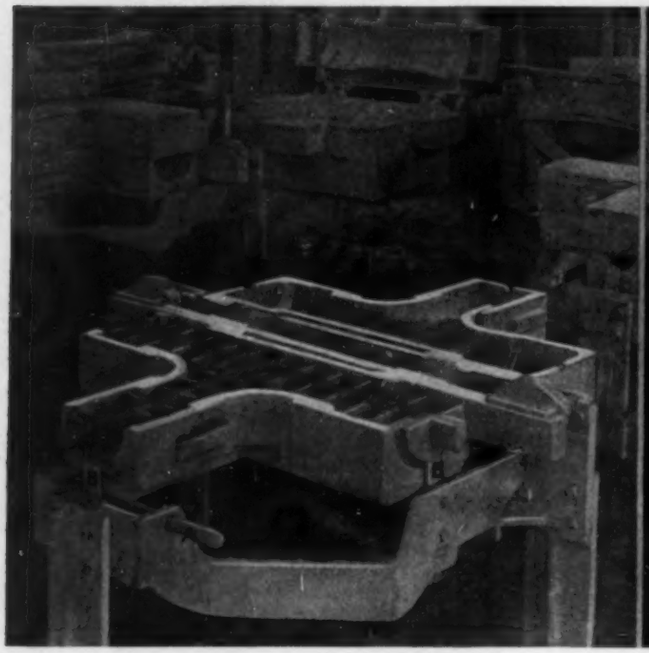


FIG 33—INGENIOUS EQUIPMENT FOR MOLDING LARGE FITTING CORES

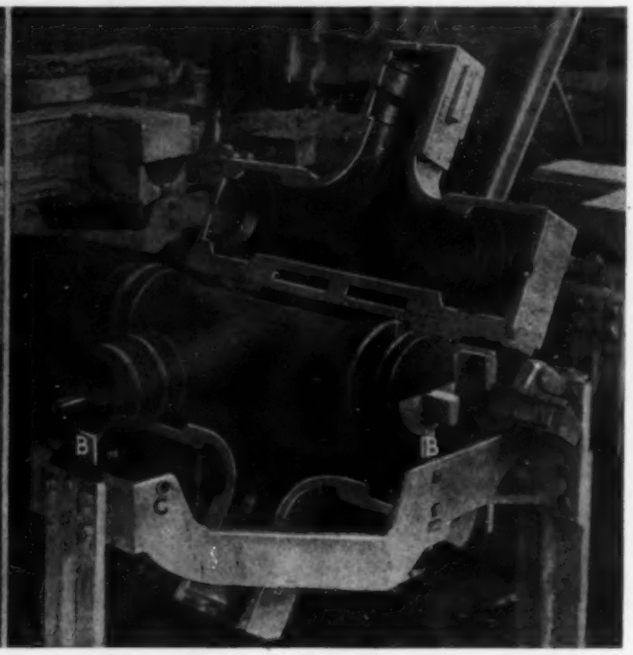


FIG. 34—THE FINISHED CORE WITH THE BOTTOM OF THE BOX LOWERED AWAY

New Liberty Mill

(*Continued from Page 39*)

feet wide and 18 feet deep, dug with a 73-ton shovel and back-filled.

All concrete was mixed in eight concrete mixers built by T. L. Smith & Co., Milwaukee, four of them of 1/3-cubic yard capacity, and the other four the small mixerette, 5 cubic foot size. The concrete for the heating furnace and mill buildings was placed from a stationary tower, 160 feet high, through spouts which could be swung to any desired location within the radius of the tower. This was supplemented by a portable tower 45 feet high. In addition to these two towers, concrete was also placed from a portable mixer carried on a flat car which was readily moved from pier to pier as the work progressed. Most of the concrete used was gravel aggregate though a great deal of it was also made with blast furnace slag. The usual practice at Homestead steel works has been to make concrete with blast furnace slag, but in this case, due to untoward circumstances, the Duquesne Slag Products Co. was not able to furnish sufficient blast furnace slag to carry the work forward as desired, and in consequence for the first time in eight years gravel concrete was employed in foundations.

The group of buildings comprise seven distinct units at West Homestead in addition to the power house extension at Carrie furnaces. The slab yard building is 70 x 293 feet; the heating furnaces building, 106 x 293 feet; the mill building, 70 x 293 feet; the shipping building, 80 x 364 feet; and the shear building, 80 x 764 feet. These are concerned with the operation of the mill proper and are steel-framed buildings with glass sides set in steel window sash manufactured by the Detroit Steel Products Co., Detroit. The metal sash and frame sections were rolled by the Carnegie Steel Co. at the Youngstown, O., mills. All these buildings have straight truss roofs with ventilator louvres. The shear and shipping buildings have roofs of a saw-tooth type. They are covered with 18-gage, copper-bearing, corrugated sheeting made by the American Sheet & Tin Plate Co. The mill superintendent's office, 46 x 64 feet, is of semifireproof construction and contains offices, vault, toilet and rest rooms. It is built of brick covered with wooden sheeting and specified roofing supplied by the Barrett Mfg. Co., New York.

Machinery Separated from Mill Proper

It is customary in rolling mills to have the mill building itself contain equipment in the way of pumps, motors, accumulators, etc. In this installation all of the subsidiary machinery has been removed from the main mill building and concentrated in a special mill office, comfort and power building, 242 feet long by 40 feet wide, built of brick and covered with specification roofing. This building contains three 500-kilowatt transformers built by the Pittsburgh Transformer Co., Pittsburgh, two 1500-cubic foot air compressors built by the Bury Compressor Co., Erie, Pa., two 5⅝ x 12-inch Epping-Carpenter duplex pressure pumps, two water filters, return water tank, 24-inch accumulator, and in addition the physical testing laboratory, physical test bending room, physical testing machine shop, locker and wash room with 288 steel lockers, inspector's offices, janitor's room, oil room, toilet room, rest room, vault, etc. It has its own heating plant in the basement.

The separation of machinery from the mill proper has made the installation clean, clear and safe. The 4000-horsepower motor which drives the mill is housed in a separate brick station built under the main mill roof and containing a separate room for the switches, resistance coils and other accessory electrical equipment.

All steel work for the mill buildings was designed by the American Bridge Co., New York. It was fabricated in part by the Ambridge plant of that company and in part by the Upper Union mills fitting shop of the Carnegie Steel Co. Work was begun on Thursday, Aug. 2, and finished on Sept. 22 in the record time of 49 days. The erection was performed chiefly with a locomotive crane fitted with an extra long curved mast. The steel work for the Carrie furnace power house extension was detailed at Homestead steel works and fabricated in its own shop. The ability of the works to manufacture and fabricate its own steel and to do machine shop work was quite a factor in the rapid construction of the buildings.

Buildings and machinery were designed and ordered without any rechecking. Drawings came out of the drafting room daily, and the most remarkable feature of the engineering work was that there were absolutely no mistakes. Not one piece went out of the shops that had to come back.

This mill is the first electrically-driven plate mill to be operated by the Carnegie Steel Co. It is entirely electrically driven from start to finish. The main motor is rated at 4000 horsepower and was built by the

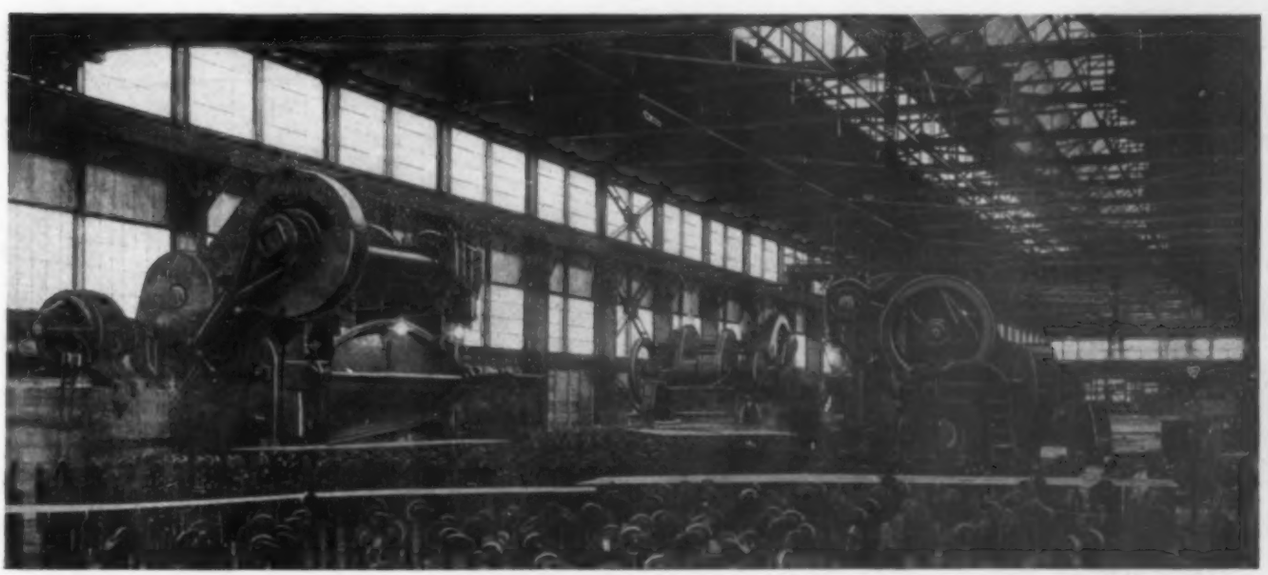


FIG. 3—SHOWING THE 110-INCH AND THE TWO 144-INCH SHEARS AND THE PLATE STANDS

General Electric Co., Schenectady, N. Y. The crane motors, table motors, shear motors, motors for driving pumps, etc., were built by the Westinghouse Electric & Mfg. Co., South Pittsburgh. The power furnished is alternating current, 3-phase, 25-cycle, 6600 volts, developed at a central power station at Carrie furnaces by a 46 x 66-inch Snow twin-tandem gas engine, directly connected to a 3750-kilovolt-ampere generator built by the General Electric Co. Power is transmitted to the mill by overhead lines carried on poles. These lines span the Monongahela river on two towers, 115 feet high, and having 30-foot bases. The main mill motor takes current at the original voltage and the auxiliary motors at 220 volts.

The Rolling Mill Machinery

The mill itself is a three-high plate mill with 110-inch length of roll body. Top and bottom rolls are 36 inches in diameter and the middle roll 21 inches in diameter. The rolls are chilled iron and were made by the United Engineering & Foundry Co., Pittsburgh.

The mill was designed by the Homestead steel works and built jointly by Mackintosh, Hemphill & Co. and the Mesta Machine Co., Pittsburgh. The former company built the mill and housings, the large castings for charging machines and the cranes, all of which were machined at the Homestead steel works. The Mesta Machine Co. manufactured the pinions, the pinion housing, the pinion shoes and the mill shoes. The practice on motor-driven mills has been to use machine-cut pinions. For this mill, however, the pinions were machine molded and operate as noiselessly as any cut gears.

The mill is served by one 16-ton crane in the slab yard, one 50-ton crane in the mill building, three 10-ton double trolley cranes in the shipping building, two 10-ton single trolley cranes in the shear building, and two 10-ton overhead traveling charging machines in the heating furnaces building. All these cranes and their equipment were made by Homestead steel works. The two side shears with 144-inch knife and the end shear with 110-inch blade, shown in Fig. 2, were built by the Morgan Engineering Co., Alliance, O. The two scrap shears were made by the Cleveland Punch & Shear Works Co., Cleveland. The straightening rolls shown in Fig. 3 were made by R. S. Newbold & Son Co., Norristown, Pa., and consist of a machine with nine rolls 14 inches in diameter and 116 inches long. The roll tables were made by Homestead steel works in its own shops.

Eight regenerative heating furnaces are housed in a separate building. This is an unusually large number for a plate mill which can generally reach its maximum rolling capacity with four or six. Extra heating furnaces were provided to care for unforeseen contingencies due to the use of cold slabs. At present the furnaces are heated with natural gas. They may be heated with either natural gas, oil or tar. Ultimately when the full schedule of improvements is completed the method of heating will be by gas brought from the Clairton coke ovens in conjunction with a small quantity of tar.

The construction of this mill so that it would be ready for operation in six months was made possible only by the closest co-operation of builders and manufacturers of structural steel and machinery. The construction record contains many incidents worthy of note. One may be mentioned. The Wheeling Mold & Foundry Co., Wheeling, W. Va., furnished the large rotary spider casting for the 4000-horsepower mill motor which the General Electric Co. was unable to cast in its own foundries due to prior business and was unable to get at any eastern foundry. The earliest delivery promised by eastern foundries was too remote. The Wheeling Mold & Foundry Co. made a new pattern and cast the spider in three weeks. The traffic manager of the Homestead steel works moved the spider and other castings from Wheeling, W. Va., to Schenectady, N. Y., in three days.

In a like manner, the General Electric Co. experienced difficulties in getting the shaft for this motor. It was made on time in the armor plate department of the steel works, and the General Electric Co. by a most extraordinary performance in its shops reduced the time of shipment of the complete motor from eight months to a little over five.

Slabs are rolled into plates up to 100 inches wide and from 5/16-inch up to 2 inches thick. However, sufficient steel for the mill is not available at present from the Homestead plant. The slabs are shipped from the Farrell steel works, Farrell, Pa., the Ohio steel works, Youngstown, O., and the Donora steel works, Donora, Pa.

The best production to date, using six heating furnaces, is 266 tons per 10 hours. With an ample supply of steel and orders of a character suitable for maximum production the mill will produce 16,000 tons of plates per month. The cost of the mill will approximate $2,500,000, including the cost of the new gas engine, generator, etc., at Carrie furnaces. On double turn it will employ approximately 250 men. The average number of men employed under the Homestead steel works organization in October, 1917, was 12,132. The production of steel ingots was about 200,000 tons, which is below maximum, the tonnage having been reduced by reason of transportation difficulties, lack of coke, labor shortage and other deterring factors.

How Ore Districts Meet War Demand

(*Continued from Page* 94)

bany mine is of the Barr-Hutchinson type and is being installed by the Allis-Chalmers Mfg. Co. The plant consists essentially of a stationary grizzly, the material passing over the grizzly being waste, while that passing through falls into pockets and is then drawn off by an apron feeder leading to a 60-inch revolving screen. The oversize from this screen is waste. The grizzly is set at 10 inches.

At the Danube mine of Pickands, Mather & Co., a new type of screening device known as the Barr-Hutchinson, will be installed by the Allis-Chalmers Mfg. Co., Milwaukee. This type of grizzly has alternate chains which run at different speed. The chains are separated by stationary rods. The grizzly is set directly over the bins. It is said that a 50-ton car can be screened, on an average, in three minutes, although on one occasion this time was reduced to 1¼ minutes. This chain grizzly is designed to screen to 4½ inches. It is electrically operated being driven by a 20-horsepower motor. The details are shown in an accompanying illustration.

Some exploratory work is being carried out on the Vermillion range by independent operators. At the Section 30 mine the operators, it is understood, have located ore at the 1000-foot level. Mining has been carried on at the 550-foot level. Coates & Tweed are drilling in the Ely district in section 7, township 61, range 14, while the Chippewa Iron Co. and W. G. LaRue are both carrying out explorations.

The Cuyuna range forwarded 2,407,983 tons of ore in 1917, compared with 1,716,218 tons in 1916. Work has been pushed actively at some of the iron ore and manganiferous properties on this range. A number of drills are at work.

Tools Back Up Nation's War Power

Tremendous Requirements of Military Supplies for American Army and Navy Force Development of Highest Efficiency in Machine Tool Building—Much Old Equipment is Reclaimed—Government Lends Effective Aid

BY HOWARD MARKT

MACHINE tools are so overwhelmingly important in the prosecution of modern warfare, that it has become increasingly common to think of the machine shop as a part of the primary line of defense, the trenches as a secondary line. The stand which the British and French armies made during the first year of the war when they matched rifles against cannon is an enduring epic of physical valor. The rapid, industrial transformation which shifted the machine shops of those countries from a moderate peacetime pace to efficient wartime speed, is an epic equally enduring if not as romantic.

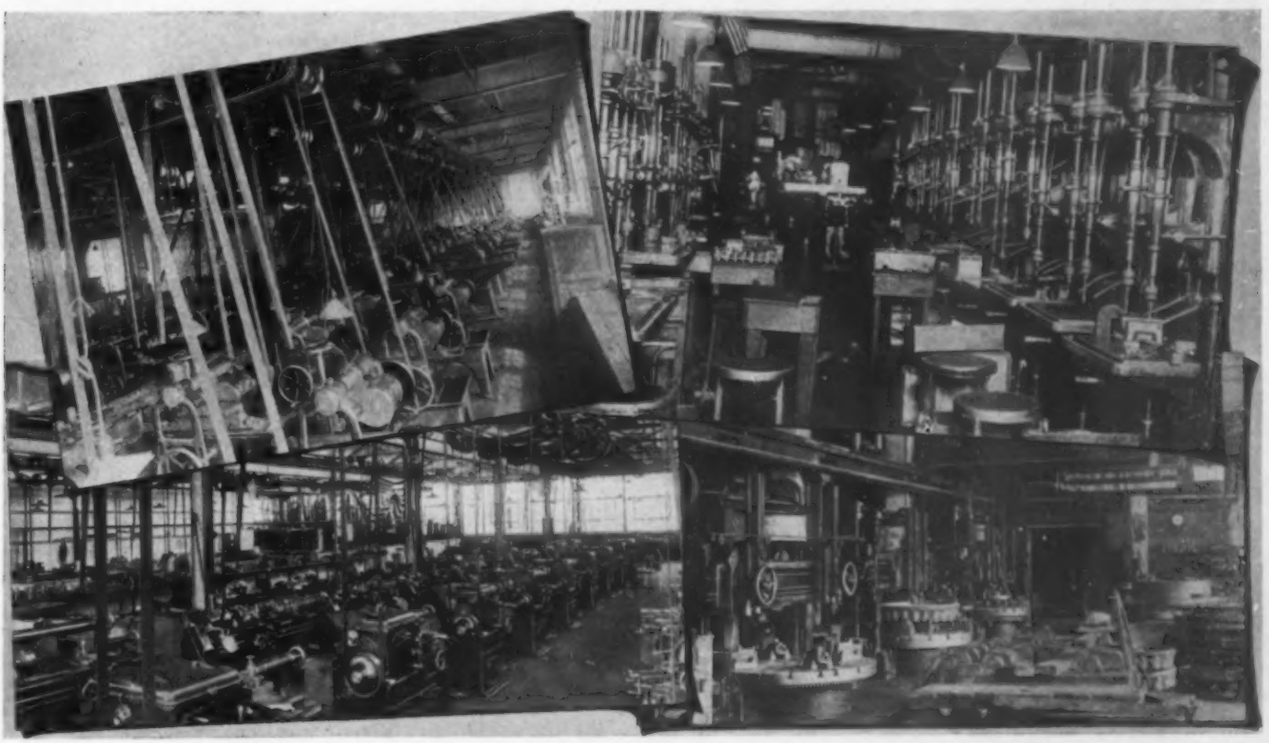
America now is passing through the same crisis. Our machine tool industry is finding that the terrific speed which the demands of England, France, Italy and Russia had forced upon it is insufficient to satisfy the requirements when Uncle Sam is a belligerent. The pressure for production has been growing almost daily. Relief from this pressure must come entirely from the country's own resources as no neutral now occupies the position this country held a few years ago—that of possessing the capacity, the skill and the advanced methods to bolster up any belligerent.

Accelerated production, at first regarded as the sole solution of the problem, is not being effected without difficulty. Labor is becoming increasingly difficult to obtain; deliveries of raw materials are being hampered; and machine tool builders because of the unusual demand for heavy equipment, are being forced to concentrate on machines which, perhaps, their plants are not adapted to build most efficiently. These factors furthered a confused condition for some time, but the vigor with which these problems are being attacked, as well as the tenacity of purpose which is being displayed largely are instrumental in bettering the existing situation.

Many builders are meeting the situation by increasing their manufacturing facilities. This is taking form largely in the construction of extensions to existing shops. A survey of shops throughout the country shows that much of the building and engineering work which is being done in the nation may be attributed directly to the machine tool industry. New England and the central west,

Speeding Up Efficiency

TREMENDOUS demands are being made upon the machine tool industry and builders are being forced to contend with constantly changing production problems. Raw materials are hard to obtain; transportation difficulties are serious, and labor is somewhat of a variable. In this article are sketched interesting changes in shop methods, which have enabled the builders to meet the government's tremendous rush requirements. By the war crisis efficiency has been made the watchword of the tool plant in a more positive fashion than ever before.



MACHINE TOOL ARRANGEMENTS IN THE FOLLOWING PLANTS: UPPER LEFT, LANDIS MACHINE CO.; BELOW, CLEVELAND MILLING MACHINE CO.; RIGHT, CUTLER-HAMMER MFG. CO.

both the centers of long-established machine tool builders, are especially active in this respect. Additions are being built, existing plants are being remodeled and the activities of the greatly curtailed building industry otherwise are being augmented by operations of this kind. Machine tool builders patriotically are turning their profits into extension work of this kind without fear of the excess profits specter which eventually may exact a heavy toll from this industry.

The acceleration of production without rearrangement of existing facilities, is being accomplished by a study of the personal factor in various shops, by effecting co-operative working plans, by increasing the rate of production through shop efficiencies, and by installing bonus systems. No industry probably is responding more liberally when considered as a composite unit in providing increased compensation for its workmen in accordance with the greater demands made upon the latter. Restricted as to labor supply by an inflexible draft system, machine tool builders are being forced to contend with a new force—that of filling the thinning ranks of skilled workmen. In some cases production is being greatly increased through the so-called dilution of labor whereby the skilled mechanic is assigned to the delicate and difficult operations, while the comparatively unskilled workman is given tasks commensurate with his skill. A gradual breaking down of the time old precedent of keeping women out of industrial work is in evidence. In the production of machine tools where skill, accuracy, patience and ingenuity are imperative, a growing tendency to employ women now is shown. While this expedient is not being resorted to widely in the United States, it is probable that as the ranks of skilled mechanics become still more depleted through the formation of additional draft units, women generally will come to take the place of the skilled male mechanics.

Machine tool production, during the past three years has equaled that of the total production of the 10 years preceding. As a result of this heavy output builders now are vigilant for any indications pointing toward the necessity for after-war curtailment. Consequently many are seizing upon the expedients of effecting maximum production by a rearrangement of existing manufacturing facilities and by effecting shop efficiencies. Many valuable lessons are being learned from the automobile manufacturer, who through scientific arrangement has been able to intensify production. Then, too, the use of modern systems of shop transportation, of improved methods for the handling of products and similar refinements of manufacture are helping to further the solution of the problem.

In the manufacture of machine tools a tendency is manifest to increase production by the grouping of various machines into large units. This, it is said, results in a highly systematized department. This breaking up of the shop into component units renders it possible for each unit to be put under the guidance of an efficient foreman and enables a specialization which is highly beneficial in the solution of new manufacturing problems. On the other hand, an arrangement of machines, such that parts are handled from machine to machine, where there are no groups of individual machines, but a sequence of machines arranged in such a way as to finish a given part with the greatest expedition, has been found very effective, especially in the building of a large number of parts of one kind. This condition prevails largely when the builder concentrates production upon one machine.

In general the use of multiple-purpose machines where skilled mechanics are available is proving to be of value; but it has been learned that where unskilled mechanics are available to fill the ranks of the skilled workman, single-purpose machines permit of much greater production under the conditions. More time is, of course, required in setting a machine which is designed to do a single thing, but it has been found that where the production is such as to warrant the use of this plan, that accuracy and intensified production are the result of attendant conditions. Much has been said in favor of both plans, but it is asserted that under conditions as they exist noteworthy results are being achieved by the use of the former system.

Perhaps no greater impetus is being given to increasing production, than by a study of transportation and carrier methods for the conveying of parts from one machine to another and finally to the assembly floor. Various forms of trucking systems,

ROOMY ASSEMBLY FLOOR AT PLANT OF LANDIS MACHINE CO.

ROOFED-IN ALLEY-WAY SUPPLIES FITCHBURG MACHINE TOOL WORKS WITH ADDITIONAL ASSEMBLING FACILITIES

either hand or motor-operated are being installed and noteworthy results are being obtained. In one instance instead of having the work and fixture taken from machine to machine on tracks, a roller type of conveyor was run parallel to the line of machines, with switches branching off to individual machines.

Trivial though it may seem, but representative of a large number of similar improvements which are being made is a noteworthy labor-saving feature evolved by one builder which resulted in a considerable saving in time. After an investigation into shop operating conditions it was learned that much time was being consumed in moving shafting from the racks in the stock room to the hacksaw where the pieces having been sawed, the remainder was returned to the stock room. Finally it was decided to reverse the process; that is, to construct a portable saw and move the saw to the stock bin, so that the required amount of stock could be sawed off without carrying the full piece to the saw and returning the remainder to the bin. The shafting is kept in bins arranged one over the other and the portable saw operates at a variable height. Under the former arrangement, it was often necessary to employ several men to move shafting to and from the saw. Now the operation is performed easily by one operator.

Assembling methods also are being perfected. While there is no tendency to burden plants with any complex equipment for handling the component parts of the machine tools in course of construction, there is a pronounced movement toward expediting the work of the assembler and relieving him from all unnecessary handling of parts. Some of the drawbacks to this plan are the initial investment required and the question whether it is advisable to install equipment of this kind in view of the uncertainty as to the market demand for machine tools after the cessation of hostilities. A manufacturer of shapers, has solved the transportation of parts to, and finished shapers from the assembly floor, in a simple, inexpensive and thorough manner. Elevating hand-operated trucks were determined upon as a means of solving the problem. After the completion of the finished parts, the small parts are collected into boxes, while the larger ones are placed on small platforms. Then by means of hand-operated lift trucks, the parts are transported to the assembling floor. Following the assembling of the various parts a truck is run underneath the skid, and the skid and completed machine are wheeled to the shipping room from which after crating the machine is transported in the same manner to the loading platform.

Machine tool builders in the present emergency are rapidly learning the soundness of some of the principles which builders of automobiles have been practicing for several years. Up to within three years ago the machine tool builder had not been pushed to capacity in the matter of production in the same manner as the builder of automobiles. Fortunately, the machine tool builder since then has come to recognize the need of such highly systematized methods. A builder of lathes in the central west had observed that there were many unnecessary and wasteful methods in use in his shop. An investigation was conducted with a view toward ascertaining and remedying these inefficiencies. It was learned that the greatest source of the shop's inefficiency was the faulty working conditions which prevailed. After carefully studying the conditions it was learned that the assembling department was at fault in many respects. A large amount of time was spent by the men in making trips to the stock room for supplies, in delivering the work to the next department after the operation had been completed, and by men loitering at their work, while on their way to the stock-room, due no doubt to attendant working conditions. To obviate any further losses of time, it was decided to develop a method to provide for the distribution of stock so that it became unnecessary for the assembler to leave his work.

Great relief is being given the order-choked machine tool market by a number of manufacturers who have been and are disposing of their surplus machinery. As a result, many dealers are conducting a lucrative business in used equipment. Obviously many of the second-hand tools that are offered are almost entirely rebuilt and serve the purpose nearly as well as new tools. Machine tools of this kind are particularly valuable because of their almost immediate availability for service after repairs or rebuilding.

SECOND-HAND OPEN-SIDE PLANER WORTH $4800

REBUILT PLANER SOLD FOR $7500

PLANER THAT ADVANCED 10 PER CENT IN VALUE

Three years' demand on the second-hand machine tool market has greatly depleted the number of machines; but old machines constantly are being discarded even at the present time. A number of instances are known of companies which have completed various contracts and which meanwhile charged the cost of equipment off against their contracts so that when they found it necessary to replace their equipment after a year of hard and intensive service owing to the exactness of the work required, a number of machines became available to the rebuilder. With careful rebuilding, many of these have been increased in value sufficiently to command prices higher than their original market value. Several munition plants are scrapping their equipment after such equipment has been in operation but a short time. During the past year two companies that had been engaged in munition work appeared in the market, having for disposal upward of 1000 machine tools. This was occasioned, it is believed, by the sudden decision of the companies to abandon the manufacture of munitions after having undergone a disagreeable experience in meeting exacting requirements.

A feature of the present used equipment market is the high prices which prevail. Not a few factors govern the prices of old equipment. The length of time the machine tool has been in service; the kind of service it has performed; the present conditions of the machine and local market conditions all share in determining the price. But the fact that a used tool almost instantly is available for service overshadows all other factors in importance at the present time in fixing the price of the used tool. These prices are unprecented in the history of the machine tool industry, when a comparison between the original and the present cost of the machine is made. It is understood, however, that although the prices of some kinds of used tools are seemingly exorbitant when compared with the original cost of the machine, the prices of new tools are keeping pace with those of old tools. This is particularly true at the present time of heavy lathes, planers and similar equipment, all of which are in great demand.

Indicative of the way in which the used tool market is being combed for heavy planers, lathes and other heavy equipment, and prices accordingly raised, two illustrations are given on page 111. The central illustration shows a 72 x 60-inch x 14-foot planer in use for many years. Except for a widening of the planer, it is practically the same as when new. This old planer has a present worth of $7500 owing to prevailing market conditions while a 60-inch planer of the same type if purchased new today would cost approximately $6800, or 10 per cent less than the old planer. Upon a consideration of the facts that deliveries are from 9 to 12 months removed and that the prices of machine tools, both old and new have advanced in different ratios, the statement does not appear so paradoxical. At the right on page 111 is a planer which sold at $4800, 10 per cent over the cost of a similar new machine today. Actually this machine cost $2600 when new. Specific instances show that while new boring mills advanced in price 52 per cent during the period from 1914 to 1917, old boring mills have increased 177 per cent; that milling machines have risen 80 per cent while old machines have advanced 200 per cent; that shapers have increased 93 per cent, while old machines have risen 100 per cent.

Government Assists Builders

The government is assisting the machine tool builder in many ways. Recently government buying of machine tools has been organized to reduce the number of conflicts between departments and to improve deliveries. This reorganization took form in the appointment of G. E. Merryweather, president of the Motch & Merryweather Machinery Co., Cleveland, in charge of the nation's machine tool requirements. Mr. Merryweather is the head of the organization which has for its object the coordination of the machine tool-producing units of the country. As a means of effecting a solution of the problem, the government, a short time ago, forbade the exportation of all heavy machine tools by private owners for use in other countries. Evidence of this is found in the refusal of the government to grant export licenses for a heavy planer and a heavy lathe lately to an American mining company for use in its mines in Mexico. The government, in addition to refusing licenses for export, even threatened to commandeer the machines in question. Further governmental aid is being given by the machine tool division of the war industries board. This department has made a careful survey of the machine tool industry with a view toward ascertaining the number of machine tools to be built in the United States during the next six months. Builders have been asked to furnish data relative thereto and dealers have been asked to submit lists showing the machines they expect to have in stock during that period. This, it is thought, will enable the government to put its finger almost instantly on any needed tools. Substantial aid also is being given to machine tool builders through the co-operation of the priorities committee. Realizing the imperative need for more tools, the government is helping builders in securing needed materials.

A short time ago it was advocated that the government lend financial assistance to machine tool builders. Many builders, it is said, could greatly enlarge their output and would do so were it not for the uncertainty prevailing as to the probable status of business after the war. With government aid, the builder would incur but few financial obligations and still be able to realize a good return for his time and services. This plan gives every indication of being a speedy means of stimulating production.

American machine tools under the fostering hands of the government and builders are attaining world recognition to an even greater extent than in their illustrious past. Builders are aware that the enormous proportions to which the industry has expanded will be more than sufficient upon the conclusion of hostilities, to supply the needs of this country and foreign buyers on the prewar scale. Consequently builders even now are preparing for their re-entrance into the foreign trade field more extensively than ever before. That there will be an enormous demand for machine tools after the war is indicated in the case of Belgium where the German war lords have ordered the plants stripped of such equipment. Germany probably will be forced to return these tools upon the termination of the war but it is probable that the intense usage to which they have been put will render them practically useless for accurate work. New tools will then be bought and because of the present favorable attitude of the Belgians toward the United States, it is thought that American tools will occupy a preferred position. This is only one example of the great market that is expected to unfold with the coming of peace. Other nations which have not participated actively in the war also will be in great need of tools. Included among these are many of the South American countries, Spain, Sweden and others which previous to the war had relied on Germany for the larger part of their machine tools. American bankers have developed plans to aid in this expansion of trade. Through machine tools, American manufacturers are to receive a new opportunity for predominance in the markets of the world.

Stabilizing Steel Trade's Future

Romantic Development from Meager Origin of Powerful Export Organizations During Period of War Signalizes Dawn of New Worldwide Vision for American Enterprise—What it Signifies—Will it Endure?

IF BRICKS and steel could talk, Broadway's towering skyscrapers might tell many a romantic business story. They might tell of brilliant coups, successful long shots and of thriving companies grown from small beginnings. Then, too, they could tell stories of failure, decay and disappointment. But even though the skyscrapers are inanimate, paper can talk, so here may be narrated one of those stories of successful business development, to which there is no reverse side. This is an account, not of a single company, but of the growth of an entire industry —the American steel trade overseas.

Not long ago, Secretary of Commerce Redfield said to an official of a steel export house, "I consider the importance of your industry as second only to those industries which are engaged in work directly connected with the conduct of the war. The degree of success which attends the efforts of American export houses will be proportionately reflected in economic conditions in this country after the war."

He said this of an industry which has been developed since Aug. 1, 1914. Prior to the war, the United States Steel Products Co., export branch of the United States Steel Corp., was the only organized effort for foreign trade and even the Steel corporation rarely devoted more than 10 per cent of its capacity to foreign business. Efforts on the part of independent steel companies were spasmodic and for the most part futile. There were a few import and export houses which occasionally accepted foreign orders for steel products as something of incidental importance. But only the domestic market was open to the great bulk of the output of this country's independent steel companies. The development, then, in three years, of an industry whose successful continuance is of the greatest importance to the future prosperity of the nation, is one of the most remarkable stories in American business annals.

Just as the development of the business as a whole has been remarkable, the growth of some of the companies

Building from Without

FEW such spectacular movements ever have been shown in American business annals as the meteoric rise of great iron and steel export companies during the past three years. The industry suddenly finds itself possessed of a strong new arm for overseas distribution which, if maintained and vigorously exercised, will mean much to iron and steel prosperity after the war. What the export companies have done and are doing to bulwark their future, is most interestingly told in this article.

THIS IS THE ORDER DEPARTMENT OF A STEEL EXPORT HOUSE WHICH LESS THAN A YEAR AGO EMPLOYED ONE STENOGRAPHER AND NOW HAS OVER 50 EMPLOYES IN ITS GENERAL OFFICES

engaged therein has been phenomenal. Several of the largest of these companies still are to celebrate their first birthday, while the pioneers are not yet of three years' standing. Some companies whose office forces a year or so ago consisted mainly of the firm and perhaps a stenographer or two now number their employes by the score and have branch offices all over the world. One house started in business less than a year ago with a capital of $500. Last month its gross business amounted to $75,000 and its cable tolls alone amounted to $1600. Although these houses have risen almost over night, they are building on rock foundations, not on sand. They are spending money lavishly to establish themselves firmly in the foreign markets. Specialists in both steel and export fields have been engaged and trained to sell steel abroad. The role of names of men prominent in the steel export trade contains many which were well-known in the steel industry long before the present export business was dreamed of and their participation is a good indication of the stability and permanency of this new field of American enterprise. The steel export houses appreciate the added difficulties thrown in their way by America's entrance into the war. They are aware of the probability of formidable European competition after the war. But they are undaunted. They expect to stay right where they are and keep on growing. The export trade admits it is a war infant in the American business family, but insists it will be a full grown adult in peace times.

Nation was Provincial

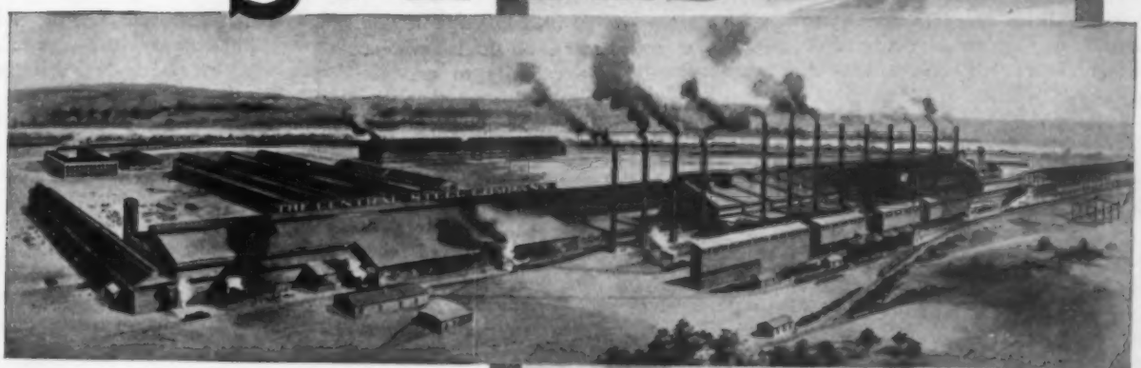
It is not necessary to describe in detail for iron and steel readers the causes which led to the present development of the steel export trade. Modern industrial history dates from Aug. 1, 1914. Prior to that date the American public in general lived in "splendid" isolation from the rest of the world, existing in blissful ignorance of international relationships and of diplomatic cross currents and of the value of foreign markets. Years of insular legislation had stunted our merchant marine until we had a tonnage hardly adequate for the commerce of a third class power. Frequent and hastily devised changes in our tariff schedules kept upsetting the entire fabric of our foreign trade. Our merchants were bound by the commercial treaties and customs of 50 to 100 years ago. Our manufacturers and bankers generally were provincial in their attitude toward foreign consumers. They were not disposed to make any vigorous effort to gain the foreign markets.

On the other hand, our competitors of England, France and Germany had made long strides in the non-producing markets, especially in South America. They had established banking facilities, adapted their organizations to their customers' methods of doing business; sold their customers the goods they wanted; granted liberal credits; obtained the advantage of lower freight rates from utilization of their own shipping to carry goods direct from their own to foreign ports; and laid down their goods in the foreign ports at lower prices than this country's merchants could effect. Even in our own market manufacturers were anxious, for the coming of a new administration had spelled the doom of the protective tariff. Steel prices were scaled down with startling swiftness, all through 1914. Industrial activity dwindled to low ebb and mills and furnaces were idle all over the country. This was the situation in the United States when the German siege guns battered down the walls of Liege.

America's business machinery almost stopped with the first shock of world conflict. Then Charles M. Schwab came

THIS IS ONE SMALL SECTION OF THE OFFICES OF A STEEL EXPORT HOUSE WHICH WAS NOT EVEN DREAMED OF A YEAR AND A HALF AGO

AGATHON Alloy STEELS



Wherever there are victories to be won over stress and strain, in peace or war, there you'll find Agathon Alloy Steels—

Their record commands respect and demands consideration from every user of alloy steel.

THE CENTRAL STEEL CO.
MASSILLON, OHIO

Branch Offices:—

Detroit Office: 326-27-28 Ford Bldg.
F. Walter Guibert, District Representative

Cleveland Office: Hickox Building
The Hamill-Hickox Co., District Representatives

Chicago Office: 1370 People's Gas Bldg., 122 So. Michigan Blvd. C. H. Beach, District Sales Manager.

Philadelphia Office: 603 Widener Bldg.
Frank Wallace, District Sales Mgr.

J. E. Dockendorff & Co., 20 Broad Street, New York. General Export Agents.

AGATHON STEELS

back from England with a pocket full of war orders and other war contracts quickly followed. Then the steel industry sprang phoenix-like from its ashes and in the period following was born the American steel export business. Hemmed in by the allies, Germany, Luxemburg, Belgium, northeastern France and Austria-Hungary ceased to figure in the world's markets. England also soon found that to manufacture war supplies it must give up much of its commercial work so she gradually abandoned most of her neutral customers. In the meantime allied orders for shell steel and other munitions had brought American industrial activity to high pitch and this activity has been maintained to the present day. Domestic demand, stimulated by unprecedented prosperity and high wages assumed unparalleled proportions. Then the neutral markets also deprived of their usual sources of supply, knocked at our doors.

Machinery of Trade Lacking

The trade for which our European competitors had striven so long, was coming to us of its own volition. Yet the American steel manufacturer still labored under the same disadvantages which had barred him from foreign markets prior to the war. First of all, the country needed ships. Its foreign credit methods were obsolete. Its manufacturers had no knowledge of the foreign field and what its needs were. They could not afford, most of them, to open offices in the various neutral countries and thus develop foreign organizations. Some of them tried, even going so far as to open offices abroad. Others placed their products in the hands of agencies. But the results were not satisfactory. To overcome this difficulty, it was suggested and widely advocated that legislation be passed by congress legalizing combinations of American manufacturers for export trade. A measure, the Webb bill, was introduced in congress but failed to pass. Only within the past month was it finally enacted.

Consequently, the need for a link between the American steel manufacturer and the foreign consumer became felt. The steel export house is that link. At present, the steel manufacturer has only to lay his goods down at tidewater to receive his money. All the complex details of the transactions, including sales, credits, shipping, insurance, etc., are assumed by the export houses.

Since steel demand has been so sweeping the past two years, some manufacturers have found selling at home so easy that they apparently have underestimated the value of opportunities presented by the foreign markets and seem not to have recognized that the export houses have a real function to perform. In this connection, let us return to Secretary Redfield's statement and see what basis exists for his opinion.

It is generally estimated that steel ingot capacity of the United States is almost 50,000,000 gross tons, whereas on July 1, 1914, the ingot capacity was about 37,000,000 gross tons. Thus the increase in slightly more than three years would be about 13,000,000 gross tons. Actual ingot output amounted to 32,000,000 tons in 1915; 24,000,000 in 1914; and 31,000,000 tons each in 1913 and 1912. Production in those years was sufficient to take care of domestic wants and allow for an exportation which rarely reached 4,500,000 tons per annum. Even in this rapidly developing country, domestic requirements will not have increased by 13,000,000 tons in three or four years, so it is evident America will have capacity to produce millions of tons more of steel than she can consume herself, with the return of normal conditions. Eugene P. Thomas, president of the United States Steel Products Co., in an address before the American Iron and Steel institute at Cincinnati in October, estimated that from 8,000,000 to 12,000,000 tons of finished steel would be the surplus which must find its way into foreign consumption after the war. Opinion generally favors the higher figure.

Samuel A. Benner, in an article "What Peace Means to the Steel Trade," published in THE IRON TRADE REVIEW April 19, 1917, published a number of valuable statistics, which attracted widespread interest in the trade, and from which he drew the following conclusions:

1.—In three years and one-half, (to Jan. 1, 1918), the world's yearly steel ingot capacity in gross tons will have increased from 85,000,000 to 102,000,000 or by 17,000,000, or by 20 per cent.

2.—In three years and one-half, the United States' yearly ingot capacity will have increased from 37,000,000 to 48,000,000, or by 11,000,000 or by 30 per cent.

3.—Prior to July 1, 1914, the United States controlled 44 per cent of the world's ingot capacity; after Jan. 1, 1918, it will control 47 per cent.

4.—Of the new capacity, the United States will control almost two-thirds.

In this article Mr. Benner pointed out that there are two great competing districts, producing 90 per cent of the world's iron and steel supplies. These two districts are the American, extending from Milwaukee and St Louis on the west to New York and Baltimore on the east; and the European, extending from Great Britain on the west to southern Russia on the east. These districts manufacture iron in its various forms not only for home consumption but also for shipment to the great non-producing markets, Latin-America, Asia, Africa and Australia. For the past quarter century neither district has shipped much to the other, the exchanges being negligible to the output. But since 1900 American shipments to overseas neutrals have gradually increased and since the beginning of the war have grown rapidly.

At the time Mr. Benner wrote this article, the United States occupied the enviable position of a prosperous neutral, the only country able to supply iron and steel for the international markets. As Mr. Benner pointed out, there were some factors favoring the United States in the prospects for after war competition. Whereas European manufacturing costs had always been lower than ours, due to cheaper labor, the necessity for heavy taxation for years to come to pay the interest and sinking fund charges of the European government's war loans promised to equalize more clearly the manufacturing costs of foreign nations with ours. On the other hand, the European district, as Mr. Benner wrote, still enjoyed tremendous advantage over the United States in the control of an extremely large percentage of all the freight carrying boats of the world. The lack of an adequate merchant marine had long been considered one of the principal obstacles preventing American participation in foreign markets.

Will Shipping Position Hold?

Our entrance into the war changed this. We too will have to pay heavy taxes in the coming years because of the present government war loans, thus losing the opportunity to gain a more advantageous position with regards to relative manufacturing costs. However, the heavy loading of freight cars in this country has enabled exporters to lay goods down at seaboard here about as cheaply as the foreign exporter could lay his goods down at his seaboard, even before the war, so there may be little change in the competitive positions in this respect. On the other hand, the need for cargo boats to defeat the intent of the German admiralty has given this country a fair start toward a merchant marine of its own. The United States government was building 1240 ships of 7,619,000 tons in 114 shipyards in this country prior to Dec. 1, 1917, including 412 ships which had been requisitioned while building for private buyers or foreign governments. On Dec. 1, the Emergency Fleet corporation was prepared to distribute 400 additional ships of 3,300,000 tons, bringing the total up to 10,919,000 tons. It is hoped to put all this vast tonnage in the water during 1918. In any event the United States shipping board is determined that 6,000,000 tons shall be completed by Dec. 31, 1918. After that, if the necessity

New Year Resolution

Say, why don't you start the New Year right? Same as I did three or four years ago.

Fill up the old Housings with HUBBARD SPECIALS and watch the difference in your tonnage records.

MORAL

If you want to tighten down on upkeep, use HUBBARD ROLLS as they sure give the service.

Rolling Mill Jim.

Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

continues, the United States will be able to launch 10,000,000 tons yearly. Thus, in the course of a year or so, the United States is to return to its old position in the front rank of maritime powers. The question is, will she remain so in peace times? Or will history a few years hence find our present growing fleet rusting at its anchorage? All farsighted men are anxious that the American merchant marine regain and retain its former high position in world shipping. To these men the National Foreign Trades Council, of which James A. Farrell is chairman, recently issued an appeal urging them to co-operate with the United States shipping board in an effort to revise the navigation laws so as to lift the handicap from American vessels. Five years after the war all government operation of merchant vessels will cease. By that time the government must sell, lease or charter these vessels to private citizens.

It is still early to formulate definite policies of our merchant marine, but this much is certain, the Iowa farmer, the Louisiana planter and the Minnesota lumberman have been aroused as never before to the necessity for a merchant marine and in the future will be inclined to lend a more sympathetic ear to those who endeavor to maintain a prominent position for this country's shipping

Steel Scarcity Aggravated

Thus this country's prospects as to after war competition have improved materially in one great essential since Mr. Benner wrote his article. But this country's entrance into the war has aggravated the scarcity of steel and rendered the situation more complex. In order to conserve the supply of materials needed for the war work of this country and the allies, as well as to prevent material from finding its way into enemy hands, a war trade board has been formed at Washington. This board has imposed some rigid embargoes on export, until now it is impossible to export many descriptions except where destined for direct use in connection with the war. Early in August ship steel exports to Japan came under the ban, although that country had on order some 400,000 tons, for use in its huge shipbuilding program. From that time on a series of negotiations took place, together with a visit of a Japanese commission to this country, to effect a plan by which Japan might be allotted a certain amount of steel in return for a given amount of vessel tonnage diverted to the Atlantic trade. Other embargoes later were imposed on exports to neutral countries, thus seriously affecting our export trade. Then the transportation of American forces and military supplies brought about the diverting of many ships from coastwise and other neutral trade to transatlantic routes. These are some of the problems with which the steel export houses now are contending. However, the United States department of commerce has indicated its realization of the value of maintaining our present foothold in foreign markets and any steel supplies which can be released will be shipped to these markets. The shipping situation will improve, no doubt, as tonnage now building is put into operation.

Millions Into Upbuilding Work

Facing the prospect of having to market 1,000,000 tons of finished steel a month after the war, the steel export houses are spending millions to establish a market for American products abroad. They are advertising trade marks, nursing along customers and paying attention to the individual wants of each customer. They are educating men who will have technical knowledge of the steel industry and at the same time know export trading and comprehend the needs of foreign markets.

Yet the burden should not fall upon the shoulders of the exporters. They should receive full co-operation, both from manufacturers and from the government. It will be up to the government to see that our merchant marine is operated at reasonable rates, so that American shippers can compete with foreigners. The government must be wise and farseeing in the forthcoming making of commercial treaties and trade agreements. The tariff schedules must be revised skillfully to meet the needs of the times. If any of the belligerents proceed, as frequently suggested, to unify their foreign trade efforts, concentrating their buying and selling organizations, our government must authorize and encourage similar steps. It is essential that measures similar to the Webb bill be passed.

Some of the responsibility also rests with the manufacturers themselves. As they now sow, so they probably will reap. An official of one of the most powerful export houses in the country criticized the policy of certain of the steel manufacturers. "If our company should desire to erect an office building in New York," he said, "we would be quoted a certain price for structural steel, with terms of 30 days net. But if we endeavor to buy the same steel for export, we are quoted a higher price and cash payment is demanded though the credit back of the purchase is the same in both cases. Why are the manufacturers so much more rigorous in their demands when they sell for export? It seems to me that if anything they should make more lenient terms on sales for export. By this statement I am not advocating a policy of "dumping" but that steel manufacturers should realize the necessity for building up the foreign markets as much as possible now to smooth the way for the future."

It is also incumbent upon manufacturers that when they undertake to supply the requirements of a foreign customer, they reserve tonnage for this customer, instead of appearing in the market intermittently, when they have a surplus to sell. They should bear in mind this customer's interests as they do their domestic customer's. Supporting the permanency of the trade, the banks have been enabled, by revision of the national banking laws, to open branches in foreign countries, and excellent banking facilities now are being developed abroad.

As for the export houses, it rests with all of them to foster the best possible feeling toward American products among foreign consumers, that they sincerely look after the best interests of their customers and dissipate any remnants of ill-reputation for sharp or careless practice such as may have been caused by a few irresponsible traders and has been magnified by German propoganda.

Much might be written of the steel export houses upon whom has fallen the heavy burden of marketing our surplus steel production after the war. Space does not permit a detailed description even of all the important houses, nor even of a listing of all the names of houses engaged to a greater or less extent in steel exporting, for at present there are 1042 importing and exporting houses in New York alone, many of whom are participating in the steel export business. But here are a few representative instances showing the rapid growth and the prominent position gained by the steel export trade together with opinion expressed by some of the leaders in the export trade:

Powerful Companies Developed

One of the youngest companies in the steel export field, yet potentially one of the strongest, is the American International Steel Corp., subsidiary of the American International Corp., 120 Broadway, New York, which owns all of its nominal capital stock of $1,000,000. The steel export company is only one of many ramifications of the mother company, which is primarily a financing house, sponsored by Frank A. Vanderlip and backed by the National City Bank of New York. The holding company was formed two years ago to assist in developing American enterprises abroad and already has great accomplishments to its credit. It has built a waterworks system in Uruguay. It is building a thousand miles of railroad in China. It owns coffee and tea import houses. It is financing American muni-

GETTIN' IN LINE WITH THE BIG BOSS

The Big Boss is all smiles and him and Little Jimmy are eating out of the same spoon. It's all on account of an order filled by the Hubbard for MACHINE MOULDED GEARS which are "some pumpkins". The B. B. slapped me on the back and says: "Jim! You should be in New Orleans playing the ponies as your tips always bring home the bacon."

My 4-11-44 Special: ***Brothers***

Let the Hubbard handle your MACHINE MOULDED GEAR requirements and you will cash in all bets.

So long,

Rolling Mill Jim.—

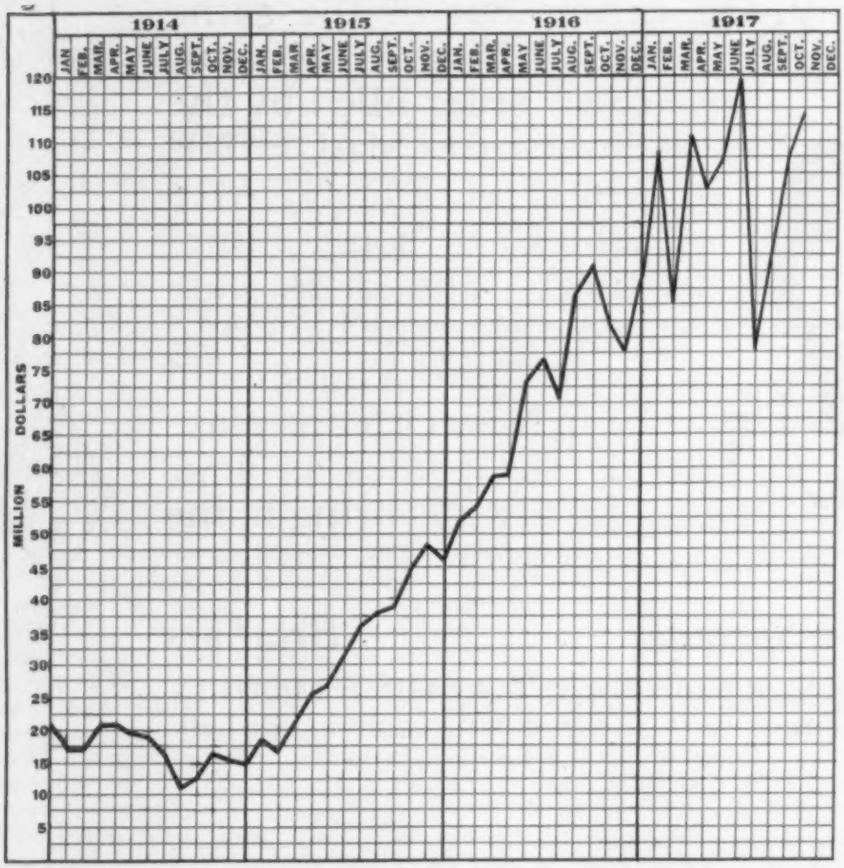
Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

Say you saw it in THE IRON TRADE REVIEW

tion companies. But its most important activities at present are in the fields of shipping and shipbuilding. Last year the corporation negotiated the sale of 165,000 tons of rails to Russia. Last June it secured the services of Edward M. Hagar, formerly president of the Universal Portland Cement Co., who immediately began to organize a steel export company. This company was formally incorporated as the American International Steel Corp., Sept. 1, 1917, and already has opened offices in Buenos Aires and London, and is preparing to open offices in Paris, Tokio and Brazil.



GROWTH OF AMERICAN IRON AND STEEL EXPORT BUSINESS SINCE 1914

It expects eventually to have representation all over the world. President Hagar says that the company is prepared to handle all forms of steel, from nails to rails, so that the foreign consumer will have only to place his order with the nearest branch and all the rest is done for him. The officers of the American International Steel Corp. are: President, Mr. Hagar; vice presidents, Morris Metcalf and J. W. Hook; treasurer, T. W. Streeter; secretary, Cecil Page.

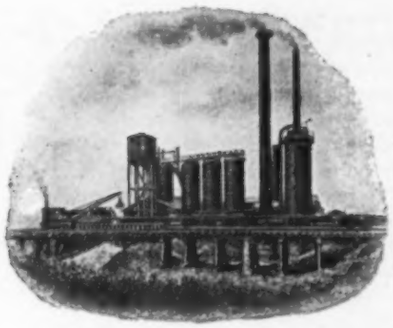
Triangle of Foreign Trade

Mr. Hagar said: "The three essentials of foreign trade are the material involved, ships and financing. The American International Corp. controls the Pacific Mail Steamship Co.; has a big interest in the International Mercantile Marine; is also in the United Fruit Co.; is associated with W. R. Grace & Co. in its shipping enterprises; owns the New York Shipbuilding Corp.; and just now is engaged in the construction of an immense government shipbuilding plant at Hog Island, Pa., with a contract to build 120 fabricated steel cargo ships at this plant. With these facilities the American International Steel Corp. doesn't need to worry about adequate shipping facilities. As it has the credit of the National City Bank of New York behind it, the steel export company is able to finance any purchase it may want to make and the strength to extend necessary terms to the foreign buyer. As for the prospects after the war, I think that this depends a good deal upon the course of the war itself. If the Germans are driven back slowly, they undoubtedly will follow their past tactics of destroying all plants and everything else in their track which of course would entail an increased amount of steel and equipment needed for reconstruction purposes and delay active competition in the neutral markets. If, on the other hand, peace were to come soon, the period of rehabilitation would be relatively shorter and competition come so much the sooner. I believe that the success of American export merchandising of steel products abroad depends to a large extent upon how soon and how thoroughly the steel industry and the general public realize this export development is vital to future prosperity in the United States"

Buys French Ship Material

The Liberty Steel Products Co, Inc., Woolworth building, New York, was organized May, 1917, by Charles J. Graham, an experienced steel man of Pittsburgh. The company's first important undertaking was its appointment as agent to purchase material for 40 ships being built by the Foundation Co, New York, for the French government, in yards at Portland, Ore., and Tacoma, Wash, which was one of the largest foreign ship orders ever placed in the United States. The Liberty Steel Products Co., Inc., is equipped for the handling of all ship material and for reconstruction work of every kind. A subsidiary company recently was formed in Paris under the name of the Societe Centrale Industrielle, which is composed of some of the leading business men of that country. This branch will handle the company's affairs in France, Spain and Belgium. Arrangements also have been made with Henry Coe, formerly of the firm of Coe & Clerci, to open a branch office in Italy, the Balkan states, Greece and Switzerland. The company is also negotiating for offices in Bombay, India, Rio de Janeiro and Shanghai, China. The Liberty Steel Products Co., Inc., has close manufacturing affiliations and its board of directors includes some of the best known steel men in the United States. Mr. Graham is president of the company; Frank J. Lanahan is vice president; J. Rogers Flannery is treasurer and P. G. Buerk is secretary.

A pioneer of nearly three years standing in the steel export field is the American Steel Export Co., Woolworth building, New York. This company, whose success and expansion have been extraordinary, was organized in June 15, 1915, by officials of the Cambria Steel Co., to secure for the Cambria Steel Co. a large share of the export offerings which were beginning to appear at that time. But the company's business developed so rapidly that the output of other mills had to be sought for the foreign buyers and up to this time the company has sold products for about 70 plants in all parts of the country. In March, 1915, the Cambria Steel Co. sold the controlling interest in the American Steel Export Co., to H. W. McAteer, formerly assistant to the president and controller of the Cambria Steel Co., and to C. B. McElhany, formerly vice president and manager of sales. These gentlemen became president and vice presi-



DELAWARE RIVER STEEL COMPANY

MANUFACTURERS OF PIG IRON

CHESTER, PENNSYLVANIA

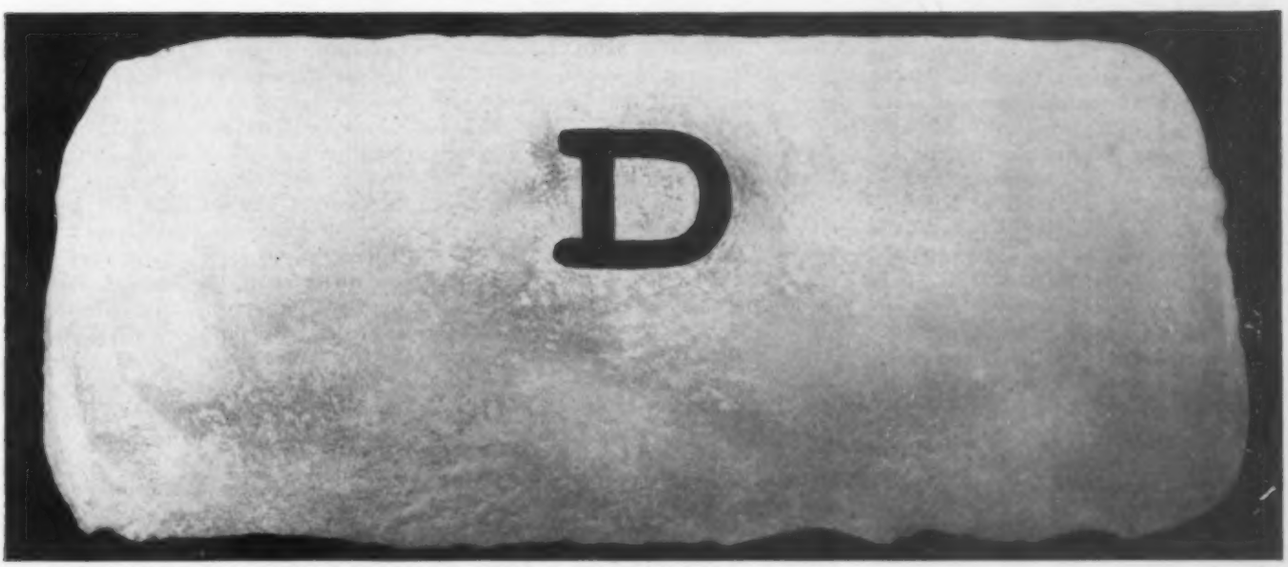
CHEMISTRY

100 WORDS

To Pig Iron Consumers:

Our last message gave you the facts concerning the physical uniformity of our pig iron. The chemistry of our iron is even more astounding. In a series of thirty tests eighteen showed no variation in silicon and sulphur throughout the entire cast. The differences in the remainder were within the personal equation of the most exact chemist. The uniformity in analysis of our iron is our appeal to you. It is cast on a pig machine and does not vary from our high standards. It is as uniform as these hundred word messages. For these reasons, when buying, buy "Delaware".

DELAWARE RIVER STEEL CO.



dent respectively of the American Steel Export Co. Kurt A. Orbanowski, formerly general manager of the steel and machinery departments of Gaston, Williams & Wigmore, Inc., New York, became a director and treasurer of the American Steel Export Co. J. P. Beal is secretary and assistant treasurer.

Allies Compete Vigorously

Mr. McElhany, discussing current conditions in the steel export field, said he thought this branch of American business had become as important as any domestic industry. "In order to keep up our gold reserves we must export as well as import," he said. "Foreign trade acts as a balance wheel to American industry and its importance should be recognized and encouraged. We are training men here especially for foreign service and are spending much money to secure a firm foothold for American products abroad. I think the government should take every step possible to promote our foreign trade interests. It is probable the country's steel ingot production now approximates nearly 50,000,000 tons a year, which means that a vast tonnage must be marketed abroad every year after the war is over. We should all bear this in mind and have an eye to the future. Of course we all realize now that the government's war needs are all important and know that many ships must be diverted from their usual routes to carry men and munitions to France. But we feel the line should be drawn no tighter than necessary lest all the work that has been done and the time and money that have been spent in developing foreign trade, be lost. There is one thing that strikes me as being worthy of consideration by Washington, and that is the continued activity of the allies in the neutral markets. We are loaning billions to the allies, yet they are competing with us on credits in South America. Recently France obtained the financing of a Brazilian railroad in competition with American bankers. Of course, this secures the future purchasing by this railroad of French products. All over South America we find that English and French houses are competing with us on terms, which seems hardly fair when we are helping finance those countries. Our representatives also are compelled frequently to meet English sellers' quotations on commercial steel products, while our country is furnishing the allies with war steel at the lower prices fixed by our government."

In February, 1917, the W. J. Crouch Co., 253 Broadway, New York, was organized, to specialize in the export of steel products. This company has also made long strides since it was formed. Victor E. Karminski, vice president and general manager of the corporation recognizing the possibilities of the foreign market for steel products, enlisted the interest of W. J. Crouch of Lafayette, Ind., who already has been successful as an exporter of horses to the allies. The company grew rapidly in size and influence, until now it is maintaining offices in Yokahoma, Barcelona, Paris, Havana, San Juan, Porto Rico, Shanghai, and expect soon to open an office in Bombay. The company's officers are as follows: President, Mr. Crouch; vice president, Mr. Karminski; treasurer, I. Smullyan; secretary, J. J. Smart; assistant treasurer, Gerold G. Freeman; sales manager, H. Lad Landau.

Export Future is Assured

Mr. Karminski said: "Today we have probably reached the 50,000,000-ton mark of production—in three years we have increased our steel capacity by 25 per cent. And still the demand for American steel exceeds the supply. Our government is making heavy requisitions and the war requirements of the allied nations must be taken care of. Lastly, the needs of the American public must be met. After all these needs have been satisfied, there remains only a very small tonnage for the export trade. This condition is only temporary. With the return of peace and normal conditions, steel production probably will exceed domestic demand by 10,000,000 tons. It will then be not only welcome but vital to the industry to dispose of its surplus in foreign markets. Considering all factors and allowing for economic and political changes to come, the future of the steel export trade is assured. The steel manufacturers who will follow sound and constructive policies aiming at a permanent export business, will benefit themselves and the industry."

Oldest and largest of all the steel export organizations in this country is the United States Steel Products Co., subsidiary of the United States Steel Corp. Under the wise guidance of James A. Farrell, now president of the Steel corporation, and later under the leadership of its present head, Eugene P. Thomas, the export branch gradually assumed an important position in the foreign markets, even prior to the war. Owning its own ships and having the strong financial backing of the Steel corporation, the Products company was able to dispute foreign territory even against keen European competition. After the war the Products company will continue an important factor in the non-producing markets, regardless of any conditions now likely to arise. But it is pointed out it is to the interest of the Steel corporation that the surplus product of independent mills also find an outlet in export trade. The corporation's export branch is of minor importance compared with its vast domestic business, which would be directly affected by an unstable domestic market resulting from inability of independents to market their surplus output abroad. Discussing the prospects for the more distant future, President Thomas expressed the opinion that a new era of railroad construction all over the world will appear as a big outlet for steel. He said:

"It should be safe to predict that the 10 years succeeding the conclusion of peace will be such an era of railroad construction as the world has not seen. And, where the railroads go, into lands old and new, there will be created a demand for the utmost volume of manufactures in the service of an improved agriculture, of irrigation, of mining, of the utilization of water power, and of the processes of an expanded and diversified industry. No "glut" of steel should be apprehended in the saner, soberer and chastened world which will emerge from the stern ordeal of the awful struggle by which it is now convulsed, because what we call the process of reconstruction will simply be the beginning of an unexampled development of the productive energy of the newly enfranchised nations.

Co-ordination is Essential

"But it should be recognized that our share of this process will be small or great in proportion as we are able to co-ordinate our vast and varied productiveness to a common end.

"All of the European countries now at war will be under the most urgent necessity of exporting their products to the greatest possible extent as a means of rehabilitating exchange and of paying for needed imports. We may expect, as a consequence of the experience gained during the war, that the manufacturing nations of Europe will have learned the absolute necessity of organization, co-ordination and co-operation. If we are to meet them in foreign markets on terms of equality, it will be necessary not only that we establish methods of mutual co-operation, but that our government aid and protect us at least as effectively as our competitors will be aided and protected by their respective governments."

Back in the earliest days of the war, the directors of the international banking house of Raymond, Pynchon & Co., saw the possibilities of developing the export trade of the United States and a coalition was formed with S. C. Munoz, who long had been identified with American steel and machinery affairs. The first contracts taken consisted of exports of horses and mules, of which over 100,000 were shipped. It was during these early transactions that the Federal Export Corp. was formed, with

Upon the Quality of Your Castings, Depends the *Success* of Your Products

Good, reliable castings mean fewer broken parts. Fewer broken parts mean more dependable products — which in turn mean *"boosts"* instead of *"knocks"*. And that's just what you want.

To those of you for whom we have made castings, we do not have to mention, *"quality"*— for to *you*, "Farrell-Cheek" and "quality" mean one and the same thing. But to those of you who have *never* called upon us to fill your requirements, we would say "We heartily assure you that you will find the quality of Farrell-Cheek Castings well worth considering."

FARRELL-CHEEK SMALL STEEL CASTINGS

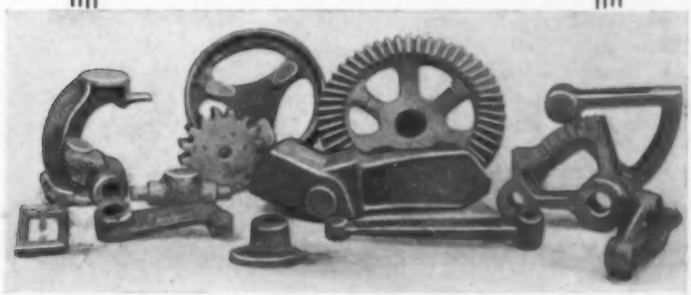
are made especially for those who *appreciate* the advantages of turning out high grade, business building products. And it is to them we cater by providing castings of unsurpassed excellence.

When you need Small Steel Castings for **Tractor Work; Machine Tool Work; Truck Work, Etc.** or when you are in need of **Blank Gears and Carbonizing and Case Hardening Boxes**

JUST WRITE US

FARRELL-CHEEK STEEL FOUNDRY CO.
SANDUSKY, OHIO

Branch Offices
NEW YORK PHILADELPHIA CHICAGO



Say you saw it in THE IRON TRADE REVIEW

Mr. Munoz as its president. Later, to expedite deliveries, a subsidiary company was formed, the Federal Shipping Co., of which J. R. Munoz was made vice president and general manager. The first ships chartered were for the sole purpose of carrying horses and when they were delivered it was found each vessel had space for 4000 to 5000 tons of cargo, which the owners had filled with coal for ballast. Conditions arose that made this combination of cargo, commercially impossible. The Federal company then had its charter revised so that it had the extra space at its disposal and looked about for materials which were essential to the conduct of the war. The success with which the horse contracts had been filled inspired confidence in the company on the part of French buyers, and orders for steel and machinery began to pour in. Mr. Munoz brought H. D. Tremper, who had been closely associated with the development of the General Electric Co., to organize this branch of the business. From that time forward many skilled men were added to handle the different lines of the company's work. Among the first of these men were Willis H. Mason, who had been export sales manager of Marcus, Mason & Co. and who had much experience in designing machinery for use overseas; Stacy Pugh of Cambria Steel Co.; Ernest G. Bliss of Westinghouse, Church Kerr Co. As steel demand grew more insistent, a steel export department was formed, with Dwight S. Guthrie, manager of the Chicago office of the Republic Iron & Steel Co., in charge. This branch was organized primarily to supply the allied governments, but later it extended its facilities to cover the other great districts abroad and by the summer of 1917 the company was firmly established in all the foreign markets. An engineering department is being organized to provide means for financing and supplying many reconstruction projects in northern France and Belgium. Mr. Guthrie, accompanied by Guy L. Bayley, who was chief engineer of the Panama-Pacific exposition, and by others of the company, is in the orient, establishing the territory from the Straits settlement to eastern Siberia. Recently Samuel A. Benner, formerly foreign and domestic sales manager of the Carnegie Steel Co. took the co-management of the steel department, to which he has added such men as Edgar I. Mills and George Summers of the Carnegie Steel Co.; P. J. Phillips of the South American department of the United States Steel Products Co., and William L. Buck of the Cambria Steel Co. In charge of the financial affairs of the Federal Export Corp. is Fred L. Watson, well known for his long services as treasurer of the American Steel & Wire Co. Some time ago, A. F. Mack, formerly general traffic manager of the United States Steel Products Co., formed the Cosmopolitan Shipping Co., with which arrangements were made by the Federal company to handle its shipments abroad. The Federal Export Corp. has outgrown its present quarters and on May 1 will remove to the 21-story building at 42 Broadway, which will hereafter be known as the "Federal Export building."

Sees Bright Outlook

Vice President Benner discusses the outlook in the steel export field as follows: "In my judgment the outlook for the export of all lines of iron and steel from the United States is brighter than it has ever been. To open up and settle this great country of ours we were compelled to develop great railroad systems and immense establishments for making steel. In consequence, our freight cars and locomotives and our blast furnaces and steel works are of the largest capacity per unit of any in the world. These large units enable us to obtain low costs per ton in both transportation and steel making, so that for some years past we have been able to deliver steel to our Atlantic seaboard ports at costs comparing favorably with those in Europe, even though the latter has had lower labor rates.

"All we needed to develop an export trade in iron and steel of huge proportions were two things: a surplus capacity in this country, and a merchant marine. We will have both of these in large proportions when the war is over.

"We will not be able to ship much iron and steel to Europe after the war nor will Europe be able to send much to North America. Each district will supply its own needs and will have a large surplus for the overseas nonproducing markets. These are Latin-America, Africa, Asia and Australia, and these immense areas have just begun to develop."

Another example of marvelous growth is found in the Vulcan Steel Products Co., 120 Broadway, New York. This company was organized in October, 1916, at that time consisting chiefly of an idea, and obscure room and a few energetic men. Recently it celebrated its first anniversary by inaugurating an advertising program to reach the uttermost ends of the earth. Today this organization has offices on five floors of the world's largest business structure, the Equitable building, and has representatives in every trade center in the world. Hardly a day passes without some expansion on the part of this company to meet its steadily growing business. Unsettled conditions of the mails have necessitated the conducting of the greater part of the Vulcan company's business by cables, and the messages became so numerous that the department handling them recently was compelled to move to more spacious quarters. Ten thousand letters are produced and sent out of the mailing department each day. Additions have recently been made to the photographic rooms, where hundreds of pictures are made daily of machinery sold by the engineering division. These pictures are shown by the salesmen where it is not possible to show actual samples. The company's directorate is comprised of men prominent in the financial and industrial world. Despite the disorganization of transportation facilities, the Vulcan company, by its association with the Otrophon Steamship Corp., has been assured of direct service to Brazil and Chile, while the company has favorable connections with other railroad and shipping interests. The Vulcan Steel Products Co. handles steel, iron and machinery, while other raw and manufactured products are handled by the Vulcan Trading Corp.

Unfortunately, space does not permit a detailed description of all of the important houses in the merchandising of steel overseas, for their work entitles them to all the credit and prominence they can be given. The country has witnessed in these houses an example of unparalleled growth the past three years, until now they have become one of the foundation stones of the nation's industries. Perhaps it would be more accurate to say that they have become the gyroscope which is to promote the equilibrium of American business after the war. The steel export trade developed because of the European war, which diverted international trade from its accustomed channels. Where before such foreign trade was desirable, it now has become essential because of the increased steel production stimulated by war demands. The biggest problems of our overseas trade have arisen since this country became an active participant in the war. Shortage of steel, diverting of cargo ships and the utilization of domestic transportation facilities to carry war supplies to seaboard may interfere to an increasing extent with our trade in the nonproducing markets as time goes on, for the principal business in hand just now is to win the war. Of next importance, however, is the economic welfare of the nation after peace comes. So it is hoped that war conditions will not interfere more than is absolutely necessary with our growing trade overseas.

"WHEELING"

DEAD SOFT

Standard Bessemer Steel Pipe

EASY TO CUT AND THREAD

SATISFIES ALL THE REQUIREMENTS OF EXACTING SERVICE
AND SAVES THE PRACTICAL PLUMBER AND STEAMFITTER

TIME, TROUBLE AND MONEY

BACKED BY QUALITY

Controlled at Every Stage of Manufacture in Our Own Mills
FROM ORE TO FINISHED PRODUCT

Tubing, Casing, Line Pipe, Drive Pipe

FOR OIL AND GAS WELLS

"WHEELING"

Highest Grade

Bright Coke Tin Plate

Made in the Most Modern Plant in the World
ANNUAL CAPACITY TWO MILLION BASE BOXES

DISCRIMINATING CONSUMERS
ARE OUR BEST CUSTOMERS

WHEELING STEEL & IRON COMPANY

WHEELING, W. VA.

Average Monthly Prices of Pig Iron, Rolled Products and Old Material in Principal Districts in 1917

Average Prices of Leading Materials at Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Pig Iron:—												
Bessemer	$35.95	$35.95	$37.45	$42.20	$44.95	$55.20	$57.95	$53.55	$48.30	$37.25	$37.25	$37.25
Basic	30.95	30.95	32.85	39.20	42.15	50.20	53.20	52.75	46.20	33.95	33.95	33.95
Foundry No. 2	31.95	33.95	36.55	39.95	43.55	51.00	55.95	55.55	48.95	33.95	33.95	33.95
Malleable	31.95	34.45	36.95	39.95	43.65	51.05	53.95	55.55	50.525	35.20	34.45	34.45
Gray forge	30.95	30.95	32.75	38.20	42.25	49.60	52.95	52.95	47.425	32.45	32.95	32.95
Ferro-Alloys:—												
Ferro-silicon (50 per cent)	$122.50	$156.25	$175.00	$187.50	$230.00	$230.00	$237.50	$225.00	$212.50	$171.25	$157.50	$172.50
Ferro-sil. (10 per cent) fur.	42.00	42.00	49.80	57.50	67.00	82.50	92.25	95.00	95.00	80.00	55.00	55.00
Semi-Finished:—												
Bessemer billets	$60.00	$62.50	$67.00	$72.50	$85.00	$93.75	$100.00	$93.00	$73.75	$58.75	$47.50	$47.50
Open hearth billets	60.00	62.50	67.50	72.50	85.00	93.75	100.00	93.00	73.75	58.75	47.50	47.50
Bessemer sheet bars	60.00	62.50	67.50	72.50	88.00	101.25	105.00	96.00	82.50	65.50	51.00	51.00
Open hearth sheet bars	60.00	62.50	67.50	72.00	88.00	101.25	105.00	96.00	82.50	65.50	51.00	51.00
Wire rods	73.75	75.00	75.00	83.75	88.00	92.50	95.00	96.00	90.00	73.50	57.00	57.00
Coke:—												
Spot furnace	$9.56	$9.75	$9.90	$7.65	$9.20	$11.15	$12.50	$13.20	$11.15	$6.00	$6.00	$6.00
Contract furnace	7.25	8.00	7.60	7.25	8.00	8.50	9.60	10.00	9.65	6.00	6.00	6.00
Spot foundry	10.40	10.90	11.30	9.65	9.65	11.20	15.00	12.70	13.35	7.00	7.00	7.00
Contract foundry	6.40	6.50	6.90	7.90	8.50	10.90	12.40	13.50	12.50	7.00	7.00	7.00
Rolled Products:—												
Structural shapes base	3.10c	3.25c	3.45c	3.70c	4.00c	4.00c	4.50c	4.50c	3.75c	3.00c	3.00c	3.00c
Plates, base	3.60c	3.75c	4.20c	4.50c	4.50c	4.50c	5.65c	6.80c	6.85c	3.25c	3.25c	3.25c
Steel bars, base	2.95c	3.00c	3.20c	3.40c	3.50c	3.65c	3.90c	4.00c	3.725c	2.90c	2.90c	2.90c
Bar iron, base	3.25c	3.25c	3.25c	3.40c	3.90c	4.60c	5.00c	5.25c	5.25c	5.25c	3.90c	3.50c
Shafting, discount	10.00	10.00	10.00	10.00	10.00	5.00	5.00	5.00	5.00	6.25	17.00	17.00
Steel pipe, ⅜ to 3 in., disc.	64.00	63.50	60.00	55.00	49.00	47.25	42.00	42.00	42.00	42.00	49.00	51.00
Standard spikes	3.40c	3.40c	3.50c	3.65c	3.90c	4.20c	4.70c	6.20c	6.50c	6.15c	5.00c	4.75c
Hoops	3.50c	3.50c	3.90c	4.10c	4.70c	5.75c	6.00c	6.00c	6.00c	6.00c	4.60c	3.50c
Bands	3.00c	3.00c	3.35c	3.35c	3.60c	5.50c	6.00c	6.00c	6.00c	6.00c	4.30c	2.90c
Structural rivets	4.25c	4.25c	4.50c	4.75c	5.05c	5.25c	5.25c	5.25c	5.25c	5.25c	5.00c	4.65c
No. 28 black sheets	4.55c	4.55c	5.05c	5.75c	7.00c	8.15c	9.00c	9.00c	8.75c	7.75c	5.25c	5.00c
No. 28 galvanized sheets	6.55c	6.80c	6.80c	7.55c	8.80c	9.95c	10.25c	10.25c	9.70c	8.80c	6.60c	6.25c
No. 10, blue annealed sheets	4.10c	4.35c	4.70c	5.35c	6.65c	8.00c	8.50c	8.50c	8.50c	7.85c	4.75c	4.25c
Tin plate	$6.85	$7.00	$7.50	$7.50	$7.90	$9.25	$10.00	$10.00	$10.00	$10.00	$8.75	$7.75
Wire nails, base	3.00	3.00	3.16	3.20	3.50	3.65	4.00	4.00	4.00	3.90	3.50	3.50
Plain wire, base	2.95	2.95	3.08	3.18	3.45	3.60	3.95	3.95	3.95	3.85	3.25	3.25
Old Material:—												
Heavy melting steel	$23.25	$21.90	$23.40	$28.15	$28.40	$40.00	$40.25	$36.60	$35.50	$31.30	$29.60	$30.00
Low phosphorus	32.00	30.00	33.00	34.25	36.60	43.50	52.75	43.00	47.25	43.50	39.00	39.00
No. 1 cast	20.00	19.75	21.50	23.35	24.60	33.25	34.75	35.00	32.50	28.00	28.50	28.50

Average Prices of Leading Materials at Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Pig Iron:—												
Lake Superior charcoal	$33.75	$34.50	$37.50	$42.25	$49.25	$51.80	$59.50	$59.50	$59.50	$48.50	$37.50	$37.50
Northern No. 2 foundry	30.00	31.25	35.70	39.25	43.20	51.00	55.00	55.00	49.50	33.00	33.00	33.00
Southern No. 2 foundry	27.50	27.65	30.20	36.50	40.00	44.25	50.00	50.00	50.00	43.75	37.50	37.50
Malleable	30.00	31.25	35.80	39.00	43.20	50.50	55.00	55.00	49.50	33.35	33.50	33.50
Rolled Products:—												
Bar iron, base	3.00c	3.00c	3.00c	3.19c	3.39c	4.00c	4.50c	4.50c	4.50c	4.50c	4.10c	4.10c
Steel bars, base	3.19c	3.14c	3.40c	3.54c	3.84c	4.50c	4.50c	4.50c	4.10c	2.90c	2.90c	2.90c
Structural shapes, base	3.19c	3.38c	3.65c	3.79c	4.34c	4.63c	5.88c	4.94c	4.46c	3.00c	3.00c	3.00c
Plates, base	3.89c	3.94c	4.59c	4.69c	5.49c	7.92c	9.64c	9.59c	7.33c	3.25c	3.25c	3.25c
No. 28 black sheets	4.69c	5.00c	5.19c	6.01c	6.99c	7.82c	9.69c	9.22c	8.94c	7.826c	7.83c	7.83c
Old Material:—												
No. 1 R. R. wrought	$23.75	$24.00	$25.75	$29.80	$32.60	$41.75	$39.13	$35.40	$36.25	$31.90	$30.60	$31.50
Heavy melting steel	20.25	21.65	23.00	26.65	28.70	37.00	35.50	33.10	32.65	27.00	28.50	28.50
Rerolling rails	27.25	25.65	27.25	31.90	36.80	46.00	46.25	41.90	41.25	36.00	35.70	35.75
Car wheels	19.75	18.30	20.30	23.25	27.20	37.00	36.75	30.70	31.00	25.90	27.50	29.50

Average Prices of Leading Materials in the East

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Pig Iron:—												
Basic, eastern Pa.	$30.15	$30.50	$33.80	$38.25	$40.80	$46.40	$50.75	$51.00	$46.50	$33.50	$33.50	$33.50
No. 2X fdy., Philadelphia	30.50	31.75	36.90	41.75	43.75	47.50	54.35	53.40	47.80	34.65	34.15	34.00
No. 2X, Virginia, furnace	26.50	28.25	34.50	38.40	41.00	46.50	52.25	51.90	46.50	33.50	33.50	33.50
Stand. low phos., Phila.	54.50	57.50	66.70	75.50	77.00	85.00	92.50	92.50	91.00	73.25	55.50	55.50
Stand. gray forge, east. Pa.	29.50	30.25	33.10	38.25	38.85	44.00	50.15	49.50	42.50	32.00	32.00	32.00
Rolled Products:—												
Tank plates, base, Phila.	4.909c	4.959c	5.409c	6.059c	6.359c	8.159c	9.409c	9.459c	7.735c	3.435c	3.435c	3.435c
Struc. shapes, base, Phila.	3.609c	3.559c	3.809c	4.859c	4.354c	4.509c	4.409c	4.509c	4.535c	3.185c	3.185c	3.185c
Steel bars, base, Phila.	3.159c	3.309c	3.459c	3.709c	3.959c	4.259c	7.009c	4.759c	4.285c	3.085c	3.085c	3.085c
Bar iron, base, Phila.	3.159c	3.209c	3.559c	3.659c	4.059c	4.209c	4.609c	4.909c	4.935c	4.935c	4.435c	4.435c
No. 10 blue anl. sh., Phila.	4.409c	4.809c	5.109c	6.359c	6.959c	8.109c	8.759c	8.759c	8.685c	7.635c	4.935c	4.435c
Open hearth billets, Phila.	$60.00	$62.50	$65.00	$77.50	$81.00	$97.50	$102.50	$102.50	$95.00	$50.50	$50.50	$50.50
Old Material:—	Delivered Eastern Pennsylvania.											
No. 1 heavy melting steel	$21.75	$20.25	$23.50	$25.00	$26.00	$32.60	$37.00	$32.80	$30.75	$26.00	$26.80	$28.00
No. 1 R. R. wrought	27.00	26.75	30.00	36.00	40.80	47.85	54.05	46.20	44.50	41.81	35.35	35.00
No. 1 heavy cast	20.75	20.15	22.50	26.75	30.00	34.75	38.35	34.10	32.90	30.00	30.50	32.00

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Average Monthly Prices of Iron and Steel Products, 1906-1917

Finished Products in Net Tons. Pig Iron and Billets in Gross Tons

1917

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$30.00	31.23	35.70	39.23	43.20	51.00	55.00	55.00	49.50	33.00	33.00	33.00
Plates Chicago	$79.60	78.80	91.80	93.80	109.80	158.40	192.80	192.00	146.60	65.00	65.00	65.00
Billets (Bess.) Pittsburgh	$60.00	62.50	67.00	72.50	85.00	93.75	100.00	93.00	73.75	58.75	47.50	47.50
Bessemer Pig Pittsburgh	$35.95	35.95	37.45	42.20	44.95	55.20	57.95	55.55	48.27	37.25	37.25	37.25
Basic Pig Pittsburgh	$30.95	30.95	32.85	39.20	42.15	50.20	53.20	52.25	43.95	33.95	33.95	33.95
Beams Pittsburgh	$61.50	65.00	69.20	74.00	80.00	80.00	90.00	90.00	75.00	60.00	60.00	60.00
Bar Iron Cleveland	$60.00	60.00	60.00	65.00	65.00	70.00	90.00	95.00	90.00	90.00	78.80	73.00
Steel Bars Pittsburgh	$59.40	60.00	64.20	67.80	70.00	72.40	77.00	80.00	74.40	58.00	58.00	58.00
No. 2 Foundry Birmingham	$23.00	24.50	28.00	35.80	35.75	35.75	46.00	48.00	43.50	33.50	33.50	33.50

1916

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$18.50	18.50	18.70	19.00	19.00	19.00	19.00	19.00	18.65	19.15	25.00	29.25
Plates Chicago	$41.00	47.00	55.00	59.00	62.00	62.00	62.00	63.00	64.00	64.00	69.20	75.00
Billets (Bess.) Pittsburgh	$33.75	34.00	40.60	45.00	44.25	41.20	40.00	43.60	45.00	45.75	52.00	58.75
Bessemer Pig Pittsburgh	$21.32	21.45	21.55	21.95	21.95	21.95	21.95	21.95	22.20	24.33	30.35	35.95
Basic Pig Pittsburgh	$19.20	18.77	19.20	19.20	18.95	18.95	18.95	18.95	19.08	20.83	25.95	30.95
Beams Pittsburgh	$37.20	40.60	48.00	50.00	50.00	50.00	50.00	50.00	52.00	54.00	57.60	60.50
Bar Iron Cleveland	$40.00	45.80	48.00	48.00	48.00	48.00	48.00	48.00	48.00	51.00	54.00	60.00
Steel Bars Pittsburgh	$37.20	40.20	46.80	50.00	50.00	50.00	50.00	50.00	52.00	52.00	55.60	58.50
No. 2 Foundry Birmingham	$14.50	14.63	15.00	15.00	15.00	14.45	14.00	13.60	14.38	15.13	19.60	23.00

1915

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.38	13.80	14.44	17.12	18.00
Gray Forge Cincinnati	$11.40	11.40	11.28	11.25	11.65	11.46	11.50	12.90	13.20	13.65	15.03	16.20
Plates Chicago	$25.60	25.40	26.80	25.60	25.80	26.20	27.80	28.80	29.80	31.10	35.80	39.40
Billets (Bess.) Pittsburgh	$19.50	19.50	19.50	19.50	19.50	19.87	21.40	23.00	24.60	25.50	27.75	29.60
Bessemer Pig Pittsburgh	$14.70	14.63	14.55	14.55	14.55	14.58	14.88	15.89	16.80	16.95	17.45	19.85
Basic Pig, Pittsburgh	$13.42	14.09	13.96	13.90	13.90	13.90	13.90	13.90	13.90	13.75	13.45	13.45
Beams Pittsburgh	$22.00	22.00	23.00	23.00	24.00	24.00	25.00	26.00	26.80	28.10	32.50	36.00
Bar Iron Cleveland	$23.00	23.00	24.00	24.40	24.00	24.00	24.00	24.50	26.20	27.75	30.00	35.00
Steel Bars, Pittsburgh	$22.00	22.00	23.00	24.00	24.00	24.00	25.20	26.00	26.80	28.20	32.50	34.80
No. 2 Foundry Birmingham	$ 9.50	9.50	9.38	9.35	9.75	9.56	9.60	11.00	11.30	11.75	13.12	14.20

1914

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$14.25	14.19	14.25	14.25	14.25	14.19	14.00	14.00	13.63	13.30	13.00	13.00
Gray Forge Cincinnati	$12.75	12.75	12.87	12.75	12.75	12.69	12.30	12.25	12.25	12.25	11.90	11.40
Plates Chicago	$26.60	27.35	27.60	26.36	25.80	25.60	25.60	27.35	27.35	26.04	25.00	24.00
Billets (Bess.) Pittsburgh	$20.00	20.75	21.00	20.80	20.00	19.75	19.30	20.00	21.00	20.60	19.00	18.50
Bessemer Pig Pittsburgh	$15.00	15.09	15.15	14.90	14.90	14.90	14.90	14.90	14.90	14.85	14.70	14.70
Basic Pig, Pittsburgh	$13.42	14.09	13.96	13.90	13.90	13.90	13.90	13.90	13.90	13.75	13.45	13.45
Beams Pittsburgh	$24.00	24.00	24.00	23.60	23.00	22.38	22.20	23.50	24.00	23.50	22.20	21.00
Bar Iron Cleveland	$26.00	26.00	24.75	24.60	24.00	24.00	24.00	24.00	24.00	24.00	23.75	23.00
Steel Bars, Pittsburgh	$24.00	24.00	24.00	23.00	23.00	22.20	22.20	23.40	24.00	23.40	22.00	21.00
No. 2 Foundry Birmingham	$10.50	10.50	10.60	10.50	10.50	10.44	10.05	10.00	10.00	10.00	9.88	9.50

1913

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$18.00	18.00	17.62	17.25	16.70	16.12	15.20	15.00	15.00	15.00	15.00	14.50
Gray Forge Cincinnati	$15.75	15.25	15.25	14.25	13.50	12.75	12.75	12.75	13.25	13.25	13.00	13.25
Plates Chicago	$33.60	33.60	33.60	33.60	32.80	32.60	32.60	32.60	31.60	30.80	28.85	27.60
Billets (Bess.) Pittsburgh	$28.20	28.87	29.00	29.00	27.37	26.50	26.50	26.12	25.00	23.00	20.87	20.00
Bessemer Pig Pittsburgh	$18.15	18.15	18.15	17.92	17.90	17.26	16.65	16.52	16.65	16.60	16.09	15.90
Beams Pittsburgh	$29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	28.25	27.40	26.00	25.00
Bar Iron Cleveland	$33.00	33.00	33.00	32.50	32.00	31.20	29.25	28.25	27.40	27.00	26.00	
No. 2 Foundry Birmingham	$13.70	13.50	13.00	12.50	11.75	10.60	10.50	11.00	11.00	11.00	10.75	11.00

1912

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$14.00	14.00	14.00	14.25	14.50	14.50	14.62	15.30	16.37	17.30	17.87	18.00
Gray Forge Cincinnati	$12.50	12.50	12.50	12.50	12.85	13.00	13.50	13.90	14.75	15.70	16.18	15.75
Plates Chicago	$26.00	25.76	25.90	27.55	28.60	28.60	29.60	30.40	31.35	32.60	33.60	33.60
Billets (Bess.) Pittsburgh	$20.00	20.00	19.88	20.00	21.10	21.88	22.25	22.40	23.75	25.70	26.75	27.00
Bessemer Pig Pittsburgh	$15.15	15.00	15.02	15.15	15.15	15.15	15.15	15.43	15.93	17.75	18.05	18.15
Beams Pittsburgh	$23.00	23.00	23.00	23.40	25.00	25.00	26.00	27.40	28.60	28.60	29.00	29.00
Bar Iron Cleveland	$24.00	23.50	23.50	24.00	24.40	25.25	27.00	27.25	29.00	30.20	31.00	31.00
No. 2 Foundry Birmingham	$10.00	10.00	10.06	10.50	10.95	11.00	11.25	11.65	12.50	13.45	13.75	13.50

1911

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$15.00	15.00	15.00	15.00	15.00	15.00	15.00	14.50	14.50	14.50	14.00	14.00
Gray Forge Cincinnati	$13.35	13.25	13.15	13.05	12.90	12.50	12.05	12.05	12.05	12.00	12.00	12.00
Plates Chicago	$31.60	31.60	31.60	30.60	30.60	30.60	30.60	29.60	29.60	26.60	25.00	25.00
Billets (Bess.) Pittsburgh	$23.00	23.00	23.00	23.00	23.00	21.00	21.00	21.00	21.00	20.00	19.70	19.25
Bessemer Pig Pittsburgh	$15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.30	15.10	15.15
Beams Pittsburgh	$28.00	28.00	28.00	28.00	28.00	27.00	27.00	27.00	26.40	24.00	22.60	23.25
Bar Iron Cleveland	$27.00	27.00	27.00	26.75	26.20	24.75	24.00	25.00	24.75	24.00	24.00	24.00
No. 2 Foundry Birmingham	$11.00	11.00	11.00	11.00	10.75	10.25	10.00	10.05	10.10	10.00	9.75	10.00

1910

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$19.00	18.75	18.25	17.00	16.75	16.50	16.50	16.50	16.50	16.00	16.00	16.00
Gray Forge Cincinnati	$16.50	16.38	15.75	14.88	14.56	14.35	14.12	13.75	13.75	13.75	13.75	13.75
Plates Chicago	$35.60	35.60	34.60	33.60	33.60	32.60	31.60	31.60	31.60	31.60	30.60	30.60
Billets (Bess.) Pittsburgh	$27.87	27.50	27.50	27.00	26.12	25.50	25.00	25.00	24.50	23.38	23.00	23.00
Bessemer Pig Pittsburgh	$19.90	19.42	18.90	18.15	17.09	16.73	16.40	16.21	15.90	15.90	15.90	15.90
Beams Pittsburgh	$31.00	31.00	30.40	30.00	30.00	29.20	28.20	28.00	28.00	28.00	28.00	28.00
Bar Iron Cleveland	$33.00	33.00	33.00	32.50	31.00	30.10	28.00	28.00	28.00	28.00	27.80	27.00
No. 2 Foundry Birmingham	$14.00	13.88	13.00	12.12	11.81	11.60	11.38	11.00	11.00	11.00	11.00	11.00

1909

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$17.44	16.75	16.50	16.46	16.21	16.41	16.90	17.37	18.20	18.87	19.00	19.00
Gray Forge Cincinnati	$14.75	14.62	13.50	13.25	13.31	13.50	13.95	14.62	15.25	16.62	16.75	16.75
Plates Chicago	$35.60	34.10	29.60	28.60	28.95	28.60	30.60	31.60	32.80	33.60	35.60	35.60
Billets (Bess.) Pittsburgh	$25.00	23.50	23.00	22.00	22.50	23.00	24.00	25.00	26.00	26.50	27.50	27.50
Bessemer Pig Pittsburgh	$17.34	16.78	16.34	15.80	15.48	16.13	16.37	17.13	18.33	19.68	19.90	19.90
Beams Pittsburgh	$32.00	29.00	26.00	24.00	25.00	26.00	27.00	28.00	30.00	30.00	31.00	32.00
Bar Iron Cleveland	$29.00	28.75	26.20	25.25	25.00	26.20	29.25	30.00	30.00	30.00	32.00	32.00
No. 2 Foundry Birmingham	$13.00	12.70	11.75	11.00	11.00	11.31	12.30	13.00	14.00	14.50	14.50	14.00

1908

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$18.24	17.87	17.42	17.21	17.00	17.31	17.00	17.00	16.75	16.50	16.75	17.35
Gray Forge Cincinnati	$14.45	14.06	13.63	13.60	13.50	13.75	13.70	14.00	14.25	14.25	14.25	14.75
Plates Chicago	$37.60	37.60	37.60	37.60	37.60	36.60	35.60	35.60	35.60	35.60	35.60	35.60
Billets (Bess.) Pittsburgh	$28.00	28.00	28.00	28.00	28.00	26.50	25.00	25.00	25.00	25.00	25.00	25.00
Bessemer Pig Pittsburgh	$19.00	17.90	17.86	17.49	16.92	16.90	16.73	16.11	15.90	15.48	16.74	17.40
Beams Pittsburgh	$34.00	34.00	34.00	34.00	34.00	33.00	32.00	32.00	32.00	32.00	32.00	32.00
Bar Iron Cleveland	$28.80	27.00	28.00	28.40	30.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
No. 2 Foundry Birmingham	$12.80	12.50	12.12	11.90	11.50	12.00	11.60	12.06	12.50	12.50	12.50	13.00

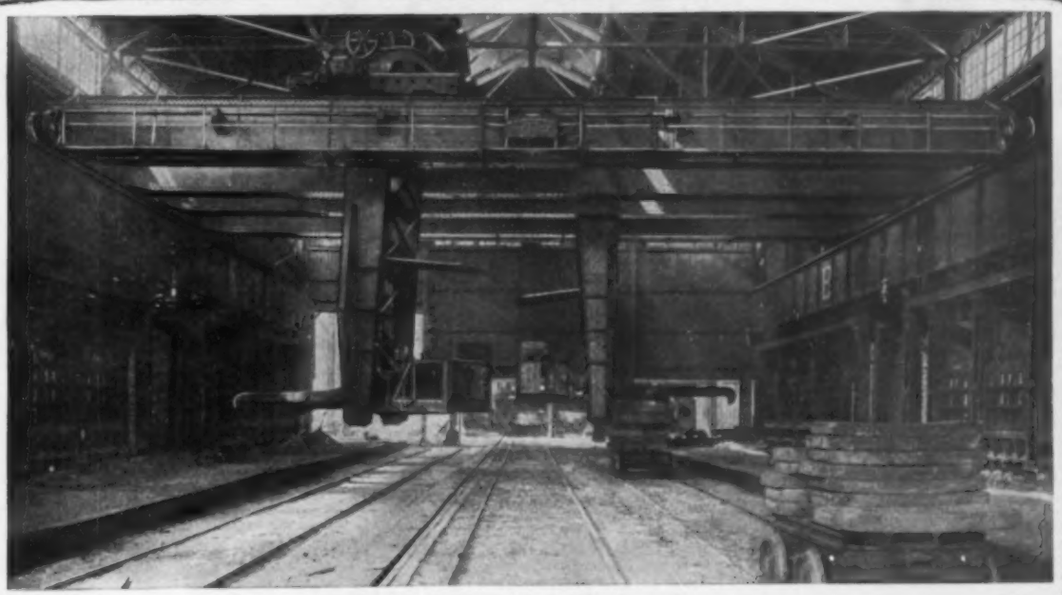
1907

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$26.00	26.50	26.75	27.50	27.40	26.50	25.40	24.50	23.60	22.60	20.60	19.00
Gray Forge Cincinnati	$22.60	22.50	22.70	21.50	21.90	21.35	20.55	19.95	18.85	18.45	17.35	15.50
Plates Chicago	$35.30	37.30	37.30	37.30	39.40	39.60	39.60	39.60	36.60	37.60	37.60	37.60
Billets (Bess.) Pittsburgh	$29.75	29.50	29.25	29.75	30.25	31.00	30.00	30.00	29.50	28.50	28.00	28.00
Bessemer Pig Pittsburgh	$22.92	23.78	22.85	22.16	24.10	24.10	23.30	22.90	22.90	22.80	20.60	19.90
Beams Pittsburgh	$34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.05	34.00
Bar Iron Cleveland	$39.00	36.50	36.00	36.00	35.00	34.00	34.00	33.00	33.00	32.50	31.00	31.00
No. 2 Foundry Birmingham	$23.00	23.00	22.75	22.00	21.40	21.25	20.50	19.80	18.12	17.65	16.00	14.91

1906

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$19.25	19.25	19.00	18.75	18.50	18.10	18.30	18.90	19.75	21.50	26.50	27.00
Gray Forge Cincinnati	$15.75	15.05	14.85	14.75	14.75	14.65	14.55	15.40	16.50	17.50	21.70	22.00
Plates Chicago	$35.30	35.30	35.30	35.30	35.30	35.30	35.30	35.30	35.30	35.30	35.30	37.30
Billets (Bess.) Pittsburgh	$27.00	27.50	27.65	27.75	27.00	26.25	27.00	28.00	28.50	28.50	29.00	29.75
Bessemer Pig Pittsburgh	$17.32	17.29	17.26	17.25	17.24	17.38	17.57	17.96	18.44	20.06	21.96	22.75
Beams Pittsburgh	$34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
Bar Iron Cleveland	$38.00	35.50	34.00	33.00	32.00	32.00	32.00	33.50	34.00	36.00	39.00	39.00
No. 2 Foundry Birmingham	$14.00	14.00	13.70	13.65	13.75	13.50	13.00	14.15	16.00	17.15	21.25	22.00

Charts based on above prices are published as a supplement of today's issue.



Crane Type Slab Chargers

For charging a single line of furnaces with slabs, blooms, ingots, etc., the W-S-M Crane Type Charger will be found most efficient.

These machines are self-propelling, being electrically operated throughout, and provided with the motors and controllers necessary to place the charger properly before the furnace, to grip and pick up the piece of material to be handled and to charge it into and withdraw it from the furnace, depositing it on Roll Table, Car or Transfer Table as required.

You will find the W-S-M line of slab chargers complete—we have or can make the type and size best suited to your requirements.

The W-S-M Crane Type Slab Chargers pictured above are in the service of the National Tube Company, McKeesport, Pennsylvania.

Principal Products of The W-S-M Company
Steel Plant Equipment:
Manipulators, Furnaces, Charging Machines, etc.
By-Product Coke Oven Machinery.
Shipyard Cranes.
Hoisting and Mining Machinery.
Ore and Coal Handling Machinery.
Special Large Cranes.
Gas Producers, Gas Valves.
Hydraulic Turbines.
Johnson Hydraulic Valves.
Steel Castings.

WELLMAN SEAVER MORGAN COMPANY
CLEVELAND
OHIO U.S.A.

Iron and Steel Prices

Corrected to Wednesday Noon

PIG IRON

Bessemer valley	$36.30
Bessemer, Pittsburgh	37.25
Basic, Pittsburgh	33.95
Basic, eastern Pa.	33.00
Basic, Buffalo	33.00
Malleable, Pittsburgh	34.45
Malleable, Chicago	33.50
Malleable, Philadelphia	37.00 to 37.50
Malleable, Buffalo	33.50

GOVERNMENT SCHEDULE

1.75 to 2.25 silicon (No. 2 foundry, No. 2 plain, and No. 3 southern)....$33 furnace base
2.25 to 2.75 silicon (No. 2X, No. 1 Northern foundry, and No. 2 southern)....base plus 50c
2.75 to 3.25 silicon (No. 1X, No. 2 soft)....base plus $1.50
Over 3.25 silicon....$34.50, plus $1.00 for each ½ per cent of silicon.

No. 1X, Phila.	35.00 to 35.25
No. 2 foundry, Pittsburgh	33.95
No. 2 foundry, Cleveland	33.95
No. 2 foundry, Ironton	33.00
No. 1 foundry, Chicago	33.50
No. 2 foundry, Chicago	33.00
No. 2X foundry, Phila.	34.00 to 34.25
No. 2X foundry, N. J. tide	34.25 to 34.50
No. 2X foundry, Buffalo	33.50
No. 2 plain, Philadelphia	33.50 to 33.75
No. 2 plain, N. J. tide	33.75 to 34.00
No. 2 southern, Birmingham	33.00 to 33.50
No. 2 southern, Cincinnati	36.40
No. 2 southern, Chicago	37.50
No. 2 southern, Phila. del.	38.30 to 39.40
No. 2 southern, Cleveland	37.50
No. 2 southern, Boston	39.50
No. 2 southern, St. Louis	35.90
Virginia, No. 2X, furnace	33.50
Virginia, No. 2X, Phila.	36.77
Virginia, No. 2X, Jersey City	37.02
Virginia, No. 2X, Boston	37.27
Silveries, 8 per cent, furnace	46.00
Silveries, 8 per cent, Chicago	48.54
Low phos. standard, Phila.	55.00 to 56.00
Low phos. Lebanon furnace	50.00
Low phos., Pittsburgh	53.00
Charcoal, Superior, Chicago	37.50
Charcoal, Superior, Buffalo	39.75
Charcoal, southern, furnace	43.00

COKE

(At the ovens.)

Connellsville furnace	$6.00
Connellsville foundry	7.00
Wise county furnace	6.00
Wise county foundry	7.00
Pocahontas furnace	6.00
New River foundry	7.00
New River furnace	6.00

FERRO ALLOYS

Ferromanganese delivered	$250.00 to 255.00
Spiegel, 20 per cent fur.	60.00 to 62.00
Ferrocarbon titanium, carloads, maker's plant	160.00
Ferrosilicon, 50 per cent, Pittsburgh	175.00
Ferrosilicon, 50 per cent, Pitts., 1st quarter	160.00 to 170.00
Bessemer ferrosilicon, 9 per cent.	$51.70
Bessemer ferrosilicon, 10 per cent.	55.00
Bessemer ferrosilicon, 11 per cent.	58.30
Bessemer ferrosilicon, 12 per cent.	61.60

Ferrosilicon prices at Ashland, Ky., Jackson and New Straitsville, O.

SEMIFINISHED MATERIAL

BILLETS

Open hearth, Pittsburgh	$47.50
Open hearth, Philadelphia	50.50
Open hearth, Youngstown	47.50
Bessemer, Pittsburgh	47.50
Bessemer, Youngstown	47.50
Forging, Pittsburgh	60.00
Forging, Philadelphia	63.00

SHEET BARS

Open hearth, Pittsburgh	$51.00
Open hearth, Youngstown	51.00
Bessemer, Pittsburgh	51.00
Bessemer, Youngstown	51.00

WIRE RODS AND SKELP

Wire rods, Pittsburgh	$57.00
Grooved skelp, Pitts.	2.90c
Sheared skelp, Pitts.	3.25c

SHAPES, PLATES AND BARS

(In cents per pound)

Structural shapes, Pitts.	3.00c
Structural shapes, Phila.	3.185c
Structural shapes, N. Y.	3.195c
Structural shapes, Chicago	3.00c
Tank plates, Chicago	3.25c
Tank plates, Pittsburgh	3.25c
Tank plates, Philadelphia	3.435c
Tank plates, New York	3.445c
Bars, soft steel, Pittsburgh	2.90c
Bars, soft steel, Chicago	2.90c
Bars, soft steel, New York	3.095c
Bars, soft steel, Phila.	3.085c
Bar iron, Chicago	3.50c
Bar iron, Philadelphia	3.685c
Bar iron, Cleveland	3.64c to 3.70c
Bar iron, New York	3.695c
Bar iron, Pittsburgh	3.50c
Hard steel bars, Chicago	3.25c
Cotton ties, Pitts., Dec.	$2.17

RAILS, TRACK MATERIAL

Angle bars, Pittsburgh, base	3.75c to 4.00c
Angle bars, Chicago, base	3.25c to 4.00c
Standard bessemer rails, mill	$38.00
Stand. open hearth rails, mill	40.00
Light rails, 25 to 45, mill	3.00c
Relaying rails, light, St. L.	75.00 to 80.00
Spikes, railroad, Pittsburgh	4.50c to 5.00c
Spikes, railroad, Chicago	5.00c to 5.25c
Track bolts, Pittsburgh	6.50c to 7.00c
Track bolts, Chicago	5.25c to 6.50c
Tie plates, Chicago	$70.00 to 75.00

WIRE PRODUCTS

(Per 100 lbs. to jobbers; retailers 5c more)

Wire nails, Pittsburgh	$3.50
Coated nails, Pittsburgh	3.45
Plain wire, Pittsburgh	3.25
Galvanized wire, Pittsburgh	3.95
Polished staples, Pittsburgh	3.65
Galvanized staples, Pittsburgh	4.35
Barb wire, painted, Pittsburgh	3.65
Barb wire, galvanized, Pitts.	4.35
Cut nails, Pittsburgh	....

CHAIN, PILING, STRIP STEEL

(In cents per pound)

Chain, ⅜ in. proof coil, Pitts. 8.00c
Sheet piling, base, Pittsburgh 4.00c to 5.00c
Cold rolled strip steel, hard coils, 1½ inches and wider by 0.100 inch and heavier, base per 100 pounds, 6.50c.

War Doubles Prices

Below are freight rates on coke, effective June 15, 1917, from Connellsville region of western Pennsylvania, per net ton of 2000 pounds:

Destination	Rate
Baltimore	$1.95
Buffalo	2.00
Canton	1.55
Chicago	2.65
Cleveland	1.75
Columbus	1.80
Detroit	2.25
E. St. Louis	2.95
Erie	1.80
Harrisburg	1.85
Joliet	2.65
Louisville	2.65
Milwaukee	3.00
New York	3.00
Philadelphia	2.20
Pittsburgh	.90
Port Henry, N. Y.	2.95
Pottstown	2.10

SHEETS

(In cents per pound.)

SHEET MILL BLACK

No. 28, open hearth, Pitts.	5.00c
No. 28, bessemer, Pitts.	5.00c
No. 28, open hearth, Chic.	5.215c

TIN MILL, BLACK

No. 28, open hearth, Pitts.	5.00c
No. 28, bessemer, Pitts.	5.00c

GALVANIZED

No. 28, open hearth, Pitts.	6.25c
No. 28, bessemer, Pitts.	6.25c
No. 28, open hearth, Chic.	6.465c

BLUE ANNEALED

No. 10, open hearth, Pitts.	4.25c
No. 10, bessemer, Pitts.	4.25c
No. 10, open hearth, Chic.	5.715c to 6.215c
No. 10, open hearth, Phila.	4.435c

TIN PLATE

(Per 100 lb. box)

Tin plate, coke base, Pittsburgh....$7.75

IRON AND STEEL PIPE

Base Pittsburgh

Base Pittsburgh	Black Per cent off	Galv. Per cent off
⅛ to 3 in., butt, steel	51	37½
¼ to 3 in., butt, iron	33	17

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	.30
Iron, 3½ to 4½ inches, c. l.	12½

CAST IRON WATER PIPE

(Class B Pipe.)

Four-inch, Chicago	$8.50
Six-inch and over, Chicago	55.50
Four-inch, New York	57.50
Six-inch and over, New York	54.50
Four-inch, Birmingham	48.00
Six-in. and over, Birmingham	45.00

Class A pipe is $1 higher than Class B.

HOOPS, BANDS, SHAFTING

Hoops, Pittsburgh	3.50c
Bands, Pittsburgh	2.90c
Shafting, Pittsburgh, carloads	17 off to list

RIVETS

Structural rivets, Pittsburgh	4.65c
Boiler rivets, Pittsburgh	4.75c
Rivets ⅞ in. and smaller, Pitts.	45 and 10 off

NUTS AND BOLTS

(Delivered within 20-cent freight radius.)

CARRIAGE BOLTS

(⅜ x 6 inches, smaller and shorter)

Rolled thread	50–5 off
Cut thread	40–10–5 off
Larger and longer	40 off

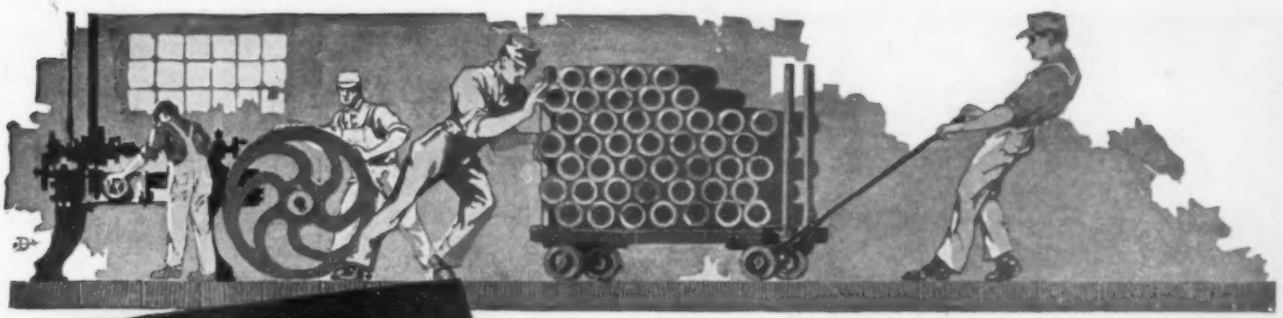
MACHINE BOLTS

(⅜ x 4 inches, hot pressed nuts)

Rolled thread	50–10–5 off
Cut thread	50–5 off
Larger and longer	40–10 off
Cold pressed semi-finished hexagon nuts ⅜ in. and larger	60–10–10 off
Cold pressed semi-finished hexagon nuts ⅞ in. and smaller	70–5 off
Gimlet and cone point lag screws	50–10 off

NUTS

Hot pressed, square blank	2.50c off
Hot pressed, square tapped	2.30c off
Hot pressed, hexagon blank	2.30c off
Hot pressed, hexagon tapped	2.10c off
Cold pressed, square blank	2.25c off
Cold pressed, square tapped	2.00c off
Cold pressed, hexagon blank	2.25c off
Cold pressed, hexagon tapped	2.00c off



A and L INTERIOR WOOD BLOCK FLOORS

"The Most Satisfactory Flooring That We Have Ever Found for a Boiler Shop"

Such is the opinion of Mr. M. F. Moore, Assistant to President, Kewanee Boiler Co. It is supplemented by the further statement:—

"We do not know of a manufacturing plant that is as hard on flooring as a boiler factory; as a matter of fact we have tried a number of different kinds of floor."

This is the word of the man who knows. The photograph bears out what he says about the severity of the service. It also shows how wonderfully the floor has stood up.

Beneath these blocks the concrete base bears up the load of these huge boilers. The pitch binder welds block to block and block to base. The surface grows more and more compact as the tough wood fibre mats together to form a wear resisting cushion.

This proves that sound principles govern the construction of the A and L Wood Block Floor, and sound material assures it a life of usefulness at lowest upkeep cost.

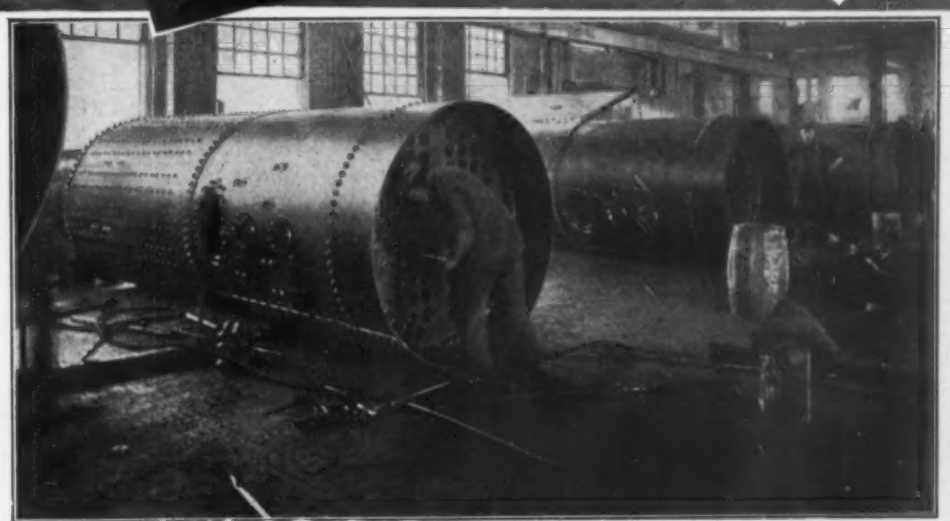
Surely when you are considering the flooring question you will avail yourself of such an unequalled guarantee of service.

Write for our Booklet—telling all about this floor. Our Engineering Department is especially well able to advise you on any flooring problem.

Ayer & Lord Tie Company
INCORPORATED
Department C, Railway Exchange, Chicago
BRANCH OFFICES:

NEW YORK
2 Rector St.
PHILADELPHIA
902 Land Title Bldg.

DETROIT
406 Empire Bldg.
CLEVELAND
221 Society for Savings Bldg



A and L Interior Wood Block Floor in plant of Kewanee Boiler Co., Kewanee, Ill.

Iron and Steel Prices

Corrected to Tuesday Noon

IRON ORE

Superior Ores, Per Ton, Lower Lake Ports.

Old range Bessemer, 55 iron	$5.95
Mesabi Bessemer, 55 iron	5.70
Old range non-Bess., 51½ iron	5.20
Mesabi non-Bess., 51½ iron	5.05

Port Henry Ores, non-Bessemer, Per Unit, Delivered Eastern Pennsylvania.

Old Bed, crude 55 iron	10.50c to 11.00c
Old Bed., concent., 65 iron	11.00c to 11.50c
Harmony, concent., 63 iron	11.50c to 11.75c
Lump (at mines)	$5.75c

WAREHOUSE PRICES

Steel bars, Chicago	4.10c
Steel bars, Cleveland	4.035c
Steel bars, Detroit	4.085c
Steel bars, Philadelphia	4.10c
Steel bars, New York	4.095c
Steel bars, St. Louis	4.17c
Steel bars, Cincinnati	4.08½c
Steel bars, St. Paul	4.22c
Steel bars, Buffalo	4.05c
Iron bars, Buffalo	4.65c
Iron bars, Chicago	4.10c
Iron bars, Cleveland	3.985c
Iron bars, Detroit	4.75c
Iron bars, St. Louis	4.17c
Iron bars, Cincinnati	4.08½c
Iron bars, Philadelphia	4.50c
Iron bars, New York	4.659c
Shapes, Chicago	4.20c
Shapes, Detroit	4.185c
Shapes, St. Louis	4.27c
Shapes, St. Paul	4.32c
Shapes, New York	4.195c
Shapes, Cleveland	4.135c
Shapes, Philadelphia	4.20c
Shapes, Buffalo	4.15c
Shapes, Cincinnati	4.18½c
Plates, Buffalo	4.40c
Plates, Chicago	4.45c
Plates, Detroit	4.435c
Plates, St. Louis	4.52c
Plates, St. Paul	4.57c
Plates, New York	4.445c
Plates, Cleveland	4.385c
Plates, Philadelphia	4.45c
Plates, Cincinnati	4.43c
No. 10 blue anl. sheets, Chi.	5.45c
No. 10 blue anl. sheets, Cleve.	5.00c
No. 10 blue anl., Buffalo	5.40c
No. 10 blue anl., shets, St. L.	5.52c
No. 10 blue anl. sheets, Cinci.	5.43c
No. 10 blue anl. sheets, St. Paul	5.57c
No. 10 blue anl. sh., Detroit	5.435c
No. 28 black sheets, Chgo.	6.45c
No. 28 black sheets, Cleve.	6.35c
No. 28 black sheets, Cinci.	5.45c
No. 28 black, Detroit	6.435c
No. 28 black sheets, St. L.	6.52c
No. 28 black sheets, St. Paul	6.57c
No. 28 galv. sheets, Chgo.	7.70c
No. 28 galv. sheets, Cleve.	7.60c
No. 28 galv. sheets, Cinci.	6.65c
No. 28 galvanized, Detroit	7.685c
No. 28 galv. sheets, St. L.	7.77c
Hoops, Cleveland	8.00c
Hoops, Detroit	6.50c

IRON AND STEEL SCRAP

STEEL WORKS USE

(Gross Tons)

Bundled sheets, Pittsburgh	$22.00 to 23.00
Bundled sheets, Cleveland	22.00 to 22.50
Bundled sheets, Buffalo	19.00 to 20.00
City wrought, short, N. Y.	26.00 to 26.50
Frogs, switches, guards, St. L.	29.00 to 29.50
Heavy melting steel, Pitts.	30.00
Heavy melting steel, Buffalo	30.00
Heavy melting steel, Chgo.	28.50 to 29.50
Heavy melt'g steel, Cleveland	30.00
Heavy melting steel, Cinci.	25.00 to 25.50
Heavy melting steel, east. Pa.	27.00 to 29.00
Heavy melting steel, N. Y.	26.00 to 26.50
Heavy melting steel, St. L.	27.00 to 27.50
Heavy melting steel, Birming.	21.50 to 22.50
Hydraulic press. sheets, Cleve.	25.00 to 25.50
Hydraulic press. sheets, Pitts.	24.00 to 25.00
Hydraulic press. sheets, Chgo.	26.00 to 26.50
Low phos. steel, Buffalo	40.00 to 42.00
Low phos. steel, Pittsburgh	38.00 to 40.00
Low phos. steel, eastern Pa.	35.00 to 37.00
Shoveling steel, Chicago	28.50 to 29.00
Shoveling steel, St. Louis	26.00 to 26.50
Steel rails, short, Chicago	34.00 to 34.50
Steel rails, short, Cleveland	31.00 to 32.00
Steel rails, short, St. Louis	36.50 to 37.00
Steel rails, old, Birmingham	28.00 to 30.00
Stove plate, Cincinnati	16.00 to 16.50
Stove plate, St. Louis	16.50 to 17.00
Stove plate, N. J. points	20.00 to 20.50
Stove plate, Birmingham	18.50 to 20.00
Stove plate, Buffalo	22.00 to 23.00
Stove plate, eastern Pa.	22.00 to 23.00
Stove plate, Cleveland	19.00 to 20.00
Stove plate, Pittsburgh	20.00 to 21.00
Cast iron borings	11.00 to 12.00

(Net Tons)

Boiler plate, cut, No. 1, Chgo.	$21.00 to 22.00
Boiler plate, cut, No. 1, St. L.	19.50 to 20.00
Bundled sheets, Cincinnati	17.00 to 17.50
Knuckles, coup., Chicago	34.00 to 34.50
Knuckles, coup., St. Louis	30.50 to 31.00
Springs, Chicago	39.50 to 40.00
Stove plate, Chicago	19.25 to 20.25

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:

Cleveland	$0.95
Newark, N. J.	3.50
Boston	3.70
Philadelphia	3.30
Pittsburgh	.95
St. Louis	3.18
Minneapolis, St. Paul	4.54

Buffalo to:

Albany, N. Y.	$1.26
New England (rail)	3.10
New York and Brooklyn (rail)	3.10

Virginia furnaces to:

Philadelphia	$3.27
New England	3.77
Brooklyn, Jersey City, Newark	3.32

Birmingham, Ala., to:

Boston	6.00
Cincinnati	2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
Minneapolis, St. Paul	5.85
New York (r. and w.)	6.00
Philadelphia (r. and w.)	5.25
Pittsburgh	4.90
Savannah, Ga.	2.75
St. Louis	3.40

Chicago to:

Des Moines	$2.80
Milwaukee	.50
Minneapolis, St. Paul	2.00
Moline, Ill.	1.15
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58
Minneapolis, St. Paul	4.54

Duluth, Minn., to:

Minneapolis-St. Paul	$1.25

Mayville, Wis.:

Minneapolis-St. Paul	$1.75

Freight Rates, Finished Material

Pittsburgh, carloads, per 100 lbs., to:

New York	19.5 cents
Philadelphia	18.5 cents
Boston	21.5 cents
Buffalo	16.0 cents
Baltimore	18.0 cents
Cleveland	13.5 cents
Cincinnati	17.0 cents
Chicago	21.5 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	79.0 cents
St. Louis	27 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	75 cents
Pacific coast (tin plate)	75 cents

IRON MILL USE

(Gross Tons)

Busheling, No. 1, Cleveland	25.75 to 26.75
Busheling, No. 1, Buffalo	26.00 to 27.00
Busheling, No. 2, Buffalo	17.00 to 18.00
Busheling, No. 1, Pittsburgh	21.00 to 22.00
Cast borings, New York	16.50 to 17.00
Cast borings, eastern Pa.	19.00 to 20.00
Cast borings, Cleveland	20.00
Cast borings, Buffalo	19.00 to 20.00
Cast borings, Pittsburgh	20.00
Cast borings, Birmingham	13.00 to 15.00
City wrought, long, N. Y.	31.00 to 32.00
Forge flashings, small, Cleve.	24.50 to 25.50
Forge flashings, large, Cleve.	24.00 to 25.00
Forge No. 1, Eastern Pa.	22.50 to 23.50
Grate bars, Buffalo	20.00 to 21.00
Grate bars, Cleveland	20.00 to 21.00
Grate bars, N. J. points	20.00 to 20.50
Iron axles, Pittsburgh	42.00 to 44.00
Iron axles, Cincinnati	42.00 to 42.50
Iron axles, Cleveland	49.50 to 50.00
Iron axles, eastern Pa.	50.00 to 55.00
Iron axles, Chicago	36.00 to 37.00
Iron rails, Chicago	38.00 to 39.00
Iron rails, Buffalo	37.00 to 38.00
Iron rails, Cincinnati	32.50 to 33.00
Iron rails, St. Louis	35.50 to 36.00
Iron rails, Cleveland	40.00 to 40.50
Machine turnings, Cleve.	20.00
Machine turnings, Buffalo	18.00 to 18.50
Machine turnings, N. Y.	16.00 to 16.50
Machine turnings, Pitts.	20.00
Machine turnings, east. Pa.	18.50 to 19.50
Machine turnings, Birming.	17.50 to 18.50
Pipes and flues, Cleveland	23.75 to 24.75
R. R. mch. cast, No. 1, Buff.	32.00 to 33.00
R. R. wrgt. No. 1, Buffalo	35.00
R. R. wrgt., No. 1, east, Pa.	35.00
Railroad wrgt., No. 1, Cleve.	35.00
R. R. wrought, No. 1, Pitts.	35.00
R. R. wrgt. No. 1, Birming.	28.00 to 35.00
Wrought pipe, Buffalo	26.00 to 27.00
Wrought pipe, eastern Pa.	30.00 to 32.00
Wrought pipe, New York	30.00

(Net Tons)

Angle bars, iron, Chicago	$37.00 to 37.50
Angle bars, steel, St. Louis	25.00 to 26.00
Arch bars & transoms, St. L.	42.00 to 42.50
Arch bars & transoms, Chgo.	37.50 to 38.50
Busheling, No. 1, Chicago	25.00 to 26.00
Busheling, No. 1, Cincinnati	21.00 to 21.50
Busheling, No. 1, St. Louis	22.50 to 23.00
Busheling, No. 2, Chicago	16.50 to 17.50
Cast borings, Cincinnati	13.00 to 13.50
Cast borings, St. Louis	16.00 to 16.50
Cast borings, Chicago	17.00 to 17.50
Cut forge, Chicago	29.00 to 29.50
Iron axles, St. Louis	44.00 to 44.50
Iron axles, Chicago	47.00 to 48.00
Machine turnings, Chgo.	17.00 to 17.50
Machine turnings, Cinci.	13.00 to 13.50
Machine turnings, St. L.	16.75 to 17.25
Pipes and flues, Chicago	22.00 to 23.00
Pipes and flues, St. Louis	21.50 to 22.00
Railroad wrgt., No. 1, Chgo.	31.25 to 32.25
Railroad wrgt., No. 1, Cinci.	28.50 to 29.00
Railroad wrgt., No. 1, St. L.	31.00 to 31.50
Railroad wrgt., No. 2, Chgo.	29.00 to 29.50
Railroad wrgt., No. 2, St. L.	29.00 to 29.50

IRON OR STEEL WORKS USE

(Gross Tons)

Axle turnings, Cleveland	$23.00 to 24.00
Axle turnings, Buffalo	26.00 to 27.00
Shafting, New York	35.00
Shafting, eastern Pa.	38.00 to 40.00
Steel car axles, Birmingham	32.00 to 33.00
Steel car axles, New York	46.00
Steel car axles, Buffalo	45.00
Steel car axles, Cleveland	46.00 to 47.00
Steel car axles, Pittsburgh	40.00 to 42.00
Steel car axles, eastern Pa.	50.00 to 55.00

(Net Tons)

Shafting, St. Louis	30.50 to 31.00
Steel car axles, St. Louis	42.50 to 43.00
Steel car axles, Chicago	43.50 to 44.50

IRON FOUNDRY USE

(Gross Tons)

Car wheels, (iron), Pitts.	30.00 to 31.00
Car wheels, (steel), Pitts.	33.00 to 35.00
Car wheels, eastern Pa.	33.00 to 35.00
Car wheels, Buffalo	33.00 to 34.00
Car wheels, Chicago	32.00 to 33.00
Car wheels, St. Louis	29.50 to 30.00
Car wheels, Birmingham	25.00 to 30.00
Car wheels, Cleveland	26.50 to 27.00
Tram car wheels, Birming.	21.00 to 25.00
Cast, No. 1, Birmingham	24.00 to 26.00
Cast, 1, machy., N. J. points	32.00 to 33.00
Cast No. 1, Cleveland	27.75 to 28.00
Cast, 1, heavy, N. J. points	30.00
Cast, No. 1, eastern Pa.	31.00 to 33.00
Cast, No. 1, Pittsburgh	28.00 to 29.00
Malleable railroad, Cincinnati	20.50 to 21.00
Malleable railroad, Cleveland	27.00 to 27.50
Malleable railroad, Buffalo	31.00 to 32.00
Malleable railroad, Pittsburgh	28.00 to 29.00
Malleable railroad, east. Pa.	30.00 to 32.00

(Net Tons)

Cast, No. 1, Chicago	25.00 to 25.50
Cast, No. 1, Cincinnati	25.00 to 25.50
Cast, No. 1, St. Louis	21.50 to 22.00
Malleable railroad, Chicago	28.00 to 28.50
Malleable railroad, St. Louis	25.00 to 26.00
Malleable agricultural, Chgo.	23.50 to 24.50

MISCELLANEOUS USES

(Gross Tons)

Reroll. rails, 5 ft. & ov., Pitts.	$34.00 to 36.00
Reroll. rails, 5 ft. & ov., Chgo.	36.00 to 36.50
Reroll. rails, 5 ft. & ov., E. Pa.	37.00 to 40.00
Reroll. rails, 5 ft. & ov., St. L.	35.50 to 36.00
Reroll. rails, 5 ft. or ov., Cleve.	37.00 to 38.00
Rerolling rails, long, Birming.	37.50 to 38.50

(Net Tons)

Boiler punchings, Chicago	31.50 to 32.00
Locomotive tires, Chicago	36.00 to 37.00
Locomotive tires, St. Louis	32.50 to 33.00